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EDUCATION

VOLUME 63 No. 2

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EDUCATION

Vol. 63 OCTOBER, 1942 No. 2

Air Age *and* Education

By N. L. ENGELHARDT, Jr.*

Acting Director of Research
Board of Education, Newark, N. J.

A DREAM OF WAR AND PEACE IN THE AIR

For I dipt into the future, far as human eye could see,
Saw the Vision of the world, and all the wonder that would be;

Saw the heavens fill with commerce, argosies of magic sails,
Pilots of the purple twilight, dropping down with costly bales;

Heard the heavens fill with shouting, and there rain'd a grastly dew
From the nations' airy navies grappling in the central blue;

Far along the world-wide whisper of the south-wind rushing warm,
With the standards of the peoples plunging thro' the thunder-storm;

Till the war-drum throbb'd no longer, and the battle-flags were furl'd
In the Parliament of man, the Federation of the world.

There the common sense of most shall hold a fretful realm in awe,
And the kindly earth shall slumber, lapt in universal law.

(TENNYSON, *Locksley Hall,* 1842)

Dreams Come True.

FROM time immemorial, man has envisioned a world at peace, a world free from want, oppression and hardship. He has slowly and painfully pushed aside the barriers of mountains, deserts and oceans seeking the resources which would make possible a better life. He has conquered the seven seas. He has lived on all continents. He has pushed his way to both poles. He has scaled the highest mountains and explored the depths of the oceans. But his quest has been frustrated by an earthbound existence.

Man's eyes have, forever past, been lifted to the skies — unconquerable except through death. He has won his peace in the heavens of winged gods and angels. His mythology has been filled with tales of magic carpets, fairies, winged horses and cherubs. Pegasus, the winged horse, "was as happy as the centuries were long." Icarus, with a fond desire to fly to heaven, used wings of wax which were melted by the sun causing him to fall into the sea. The Greek gods tra-

* Author of "Education for the Air Age," The Macmillan Company, New York, 1942.

versed the skies. Mercury was provided with a symbolic pair of wings. In the Psalms one reads,

He rode upon a cherub, and did fly: yea, he did fly upon the wings of the wind.
(Psalms XVIII, 10, c. 150 B. C.)

In the Koran the following verse appears,

Praise be to Allah, the creator of the heavens and earth, who maketh the angels his messengers, and giveth them two, three, or four pairs of wings.
(The Koran, XXXV, c. 625)

Throughout history man has prayed, hoped and dreamed that he could attain the freedom of winged creatures. With wings he could win peace which was not for those earthbound. Through his religion and art he has expressed his longing to be released from the bonds which hold him to the earth.

Stone walls do not a prison make,
Nor iron bars a cage;
Minds innocent and quiet take
That for an hermitage;
If I have freedom in my love,
And in my soul am free,—
Angels alone, that soar above,
Enjoy such liberty.
(Lovelace, To Althea, from Prison)

Probably none other of man's attainments has had the driving force of centuries of dreams and hopes. Ancient philosophers sought to understand the principles of bird flight. Hundreds of attempts to fly have been recorded over the past two thousand years. Scientists through the centuries since Roger Bacon have striven to devise flying machines. And behind all of these efforts one can find the constant encouragement of artists, poets, dreamers and thinkers.

Finally, in 1783, the actual conquest of the air began. The first ascents of man were made in that year by means of balloons. The age-old dreams were beginning to come true. The realization that man had achieved that which he had worshipped and praised as the gate to peace and freedom brought forth expressions of new hope for mankind.

Through the years to follow the first ascents. the development of flying was depicted in prints, etchings, paintings and photographs. Popular imagination of the potentialities of flight stimulated the writing of over fifteen hundred pieces of music, hundreds of poems and stories in prose. Probably never in the history of science had any achievement received so much artistic accompaniment and enthusiastic acclaim prior to its perfection as a useful instrument.

The faith of man for centuries had been founded on wings. Science had shattered his dreams but had brought a new hope. Would man's ability to fly bring peace on earth as the wings of angels brought peace in heaven? Had man achieved the freedom which he worshipped? To those who have experienced the freedom of the skies and looked down on earth's last barrier, the answer is clear.

Oh, I have slipped the surly bonds of earth,
And danced the skies on laughter-silvered wings;
Sunward I've climbed and joined the tumbling mirth
Of sun-split clouds — and done a hundred things
You have not dreamed of — wheeled and soared and swung
High in the sunlit silence — Hov'ring there,
I've chased the shouting wind along and flung
My eager craft through footless halls of air.
Up, up the long delirious, burning blue,

I've topped the wind-swept heights with
easy grace,
Where never lark, or even eagle, flew;
And, while with silent, lifting mind I've
trod
The high untrespassed sanctity of space,
Put out my hand, and touched the face
of God.

(By John G. Magee, Jr., High Flight, 1941, killed in action with the R.C.A.F. December 11, 1941.)

Science Triumphs.

Scientific attainments of the past century have stampeded a civilization built on hopes and dreams. The world has been left in a turmoil. Every aspect of life and thought is undergoing the most painful alterations. To America, the past century has brought a change from an agricultural civilization to a technological civilization. Machines have introduced a new attitude toward life. Men of science see the horizons of a better life. Greedy men have directed the achievements of the age to selfish purposes. Others have surrendered to the tremendous complications of readjustment to the new world.

Science is a living, growing force. As its roots spread its trunk and limbs become stronger and broader. The attainments of science are evolutionary. Their development is based on the accumulation of knowledge. Inventions become the parents of future inventions. Every addition to scientific knowledge increases the rate at which subsequent inventions can be made. The achievements of man continually increase in importance to civilization simply because of the experience which has founded them.

The spread of technology is broadened by the advancement of education. It is in those countries which provide the greatest opportunities for education of youth that technology has moved ahead most rapidly. As science progresses and becomes more complex, as the advance of technology creates new impacts on individuals and society, this educational base needs to be expanded. It is where such expansion is taking place that the most significant contributions to the welfare of mankind are forthcoming.

Scientific progress is accelerated by improvements in the transmission of ideas. Communication is the means by which all knowledge can be brought together to impinge on the solution of new problems. It is also the means by which these solutions, scientific attainments, can be spread throughout the world. Obviously, any method of communication which tends to speed up these processes also quickens the pace at which technology moves forward.

It is into such a civilization that the airplane has come. It is no accident of fate, no revolutionary concept that has given wings to man. The development of the airplane has been an evolutionary process, the beginning of which dates back many decades. Da Vinci, Roger Bacon, Bernoulli, Borelli, and the balloon experimenters of the eighteenth century helped to build up a vast store of understandings. In the nineteenth century hundreds of amateurs and scientists added to knowledge with the development of gliders. The propeller was used on sea-going vessels in the early part of this century. The internal combustion engine was developed. It remained for the Wright brothers to bring all these scientific attainments together to show man how to fly. Since Kitty Hawk, engineers have ap-

plied an increasing amount of knowledge to the perfection of the airplane as a useful implement.

Today the airplane has in itself become an attainment from which will flow many new advancements for technological civilization. It will speed up the processes of scientific development. It will create need for expansion of educational opportunities for youth and adults so that all may understand its implications as a dynamic force in society. It will increase the tempo of scientific achievements in many fields. In many respects the airplane is one of the most, if not the most, important achievement of science in history. It is especially so because its use has impacts on so many aspects of man's society. Many of these impacts are discernible today. Many cannot be foreseen. It is the responsibility of intelligent men to try to comprehend these impacts and to direct them toward the achievement of a better world for all mankind.

Men Must Set the Course.

In 1881, L. P. Mouillard, who did more than anyone else to furnish the inspiration that carried the Wrights through to final success, wrote:

"If there be a domineering, tyrant thought, it is the conception that the problem of flight may be solved by man. When once this idea has invaded the brain it possesses it exclusively. It becomes a haunting thought, a walking nightmare impossible to shake . . .

But finally let us admit that the problem has been solved, and let us speculate upon the effects on society. . . . All will have to be done over again; the fortifications, the maneuvers, the defenses of the frontiers, strategy, all is reduced to nothing. It will even cause, in a very short time, the suppression of nationalities, and races will be rapidly commingled or destroyed, for there will no longer be efficient barriers, not even that movable barrier which we call an army. No more frontiers! No more insular seclusion! No more fortifications! Will society perish?

As to the procedure that society will adopt to conform to this new mode of existence, I have not the least idea, yet it may be affirmed that society will emerge victorious from the struggle. After the cataclysm caused by injured interests, a period of restored equilibrium will follow; and in the end, at the expense of a time of distress, humanity will enter into possession of the empire of the air."

It is a quirk of human nature to resist change. In science this is called inertia. Man's ability to overcome inertia might be a measure of intelligence. The development of a dynamic force such as communication by air accentuates this trait. It creates friction and friction requires force to overcome. If the quantity of friction is small, less force is required to overcome it than if it is large. The development of air power in World War II has indicated sources of friction. A few men, traditionally bound to sea power or land armies, have belittled the potential force of air power. Even in the face of the loss of the *Bismarck, Repulse, Prince of Wales,* and the attacks on the great fortresses of Pearl Harbor, Singapore and Corregidor, these traditionalists still clung to old faiths. The suggestion that air transport might take over the cargoes of trans-oceanic commerce brought resistance from those who had devoted their lives to the creation of a merchant marine. International airlines were established for political and economic expediency rather than the welfare of all humanity. Pipelines, the blood streams of air commerce, were

delayed in construction because of the fear of competition with the huge tanker fleet and the railroads. Can it be that these men are haunted with fear of the potential impacts of flight? Why must men be so blind as to try to block the progress of the one attainment which promises to set them free? Will society perish at the hands of those few who refuse to see the light?

To those scholars and engineers, whose lives are devoted to the interpretation of science, there is but one answer. The airplane is their latest product. It has grown from the roots of all past scientific achievements. It satisfies all of the requirements of transportation in the past and in addition meets the new needs of an advancing civilization. The future of the airplane is secure with the knowledge that man wanted to develop it to aid him in creating a better life and a finer world in which to live that life. To deny the airplane its rightful place in civilization is to apply the brakes to scientific advancement. To delay its application to the needs of mankind is to postpone the day when man can achieve his ultimate goal of peace. To limit its use because of political or economic determinants which have grown out of an earlier organization of civilization will be a basis for future conflict.

Men, ordinary men, the citizens of a free nation, must set the course to the future. To do so may mean tremendous sacrifices of mores and traditions. But whatever these sacrifices may be, the fact remains that free and intelligent use of the air promises rewards which have been in man's dreams through the centuries of conflict and strife.

The Nature of the Air-Age.

What are some of the impacts of the air age toward which we should direct our thoughts? Obviously it will do no good to try to forecast the development of air-age civilization, but many impacts are clearly discernible today. We know, for example, that the airplane has two distinct values: speed and universality of movement. Increased speed of communication shrinks the size of the earth. Assuming proper aids to air navigation, every part of the earth is within forty-eight hours of the U. S. A. Young boys who up to a year ago had never been past the nearest creek from their homes, are today making daily visits to the countries of the United Nations. Some of them who up to recently lived in Shangri La have experienced civilization in all its forms in the course of a few days' travel. Speed means unity and understanding. The international airports, like the telephone or the daily visit of a train in a small western village, bring men closer together for common understanding and the common good. The air-borne men of the United States Air Force are the ambassadors of good will — one of the greatest unifying force that the United Nations possess. Tomorrow this spirit of unity must expand under freedom in the empire of the air.

Universality of movement is the second major concept of flight. It was Tertullian who wrote,

> Every angel and demon is winged. Consequently, they are everywhere in a moment; to them the whole world is one place.

The airplane will open up the great interiors of continents which could never be reached by sea-going vessels.

The airplane has the inherent characteristic of freedom to move in all directions, to land where its pilot wishes, and to traverse the shortest routes regardless of barriers to earthbound transportation.

Because of the limitations of two-dimensional travel the civilized world has been developed largely along accessible sea coasts. The vast resources of inland Africa, South America and Canada remain to be developed by air communication. Today fleets of transport planes are flying over many of these stretches. Commercial air routes have reached into many of these interiors bringing new potentialities for the expansion of the habitable areas of the globe.

Polar flying will soon be commonplace. Traveling at altitudes of 20,000 to 30,000 feet above storm areas is already developed. Speeds of 300 to 500 miles an hour will be standard on commercial airlines. Luxury planes weighing 100 tons and more will be used. Aerial freight trains with a locomotive plane and a string of freight gliders tied on behind are on their way. These things are coming at the close of the war. What adaptations in industry and commerce will be required to meet the needs of civilization which has received the impact of this new and dynamic force?

Urban Decentralization.

In the urban centers of America the family has been disrupted as a sound social unit. In population centers of over 100,000 inhabitants, the typical family does not have a sufficient number of children to maintain the population without immigration. Many of these centers are losing population through migration of the higher economic groups to suburbs. Those remaining are unable to pay for the support of city services such as police and fire departments, public schools and street cleaning. The entire structure of urban life is toppling under the impacts of improved facilities for transportation, especially the highways.

No sooner have we begun to feel the results of extensive development of automobiles and trucks, than the airplane arrives on the scene.

I am not one of those who feel that private planes are going to supplant automobiles. I am sure they are not for a long time to come. The technical obstacles created by the elements are too difficult to overcome to expect individual operation of private planes with the same regularity and dependability of cars. Furthermore, cities just will not provide adequate airports for swarms of planes. To do so would require tearing down at least twenty-five per cent of the housing. The airplane is a machine which is very inefficient in congested areas. The high speeds require that they be spaced well apart and especially so in "blind" flight. Private flying will boom after the war, without a doubt, but it will not be a commuter service between large cities and suburbs. The automobile will still handle this kind of transportation.

The most serious impact of the airplane on urban centers will come through the migration of industries. It is already pretty much a proven fact that freight can be hauled cheaper by air than by railroad or truck, under proper conditions. One of these conditions is that factories be located alongside a landing field. In many

cases these can be simply private landing strips for freight gliders or freight planes. Located on an air freight route, such factories will be able to make overnight deliveries to all points in the United States; and within a few years, next-day deliveries in Europe and South America will be possible.

Industrial plants and mail-order houses utilizing air freight service will locate in rural areas where taxes are low, sites large, and transportation cheap and rapid.

This relocation of industry will, of course, have disastrous effects on urban cities which have grown through railroad and steamship transportation. But for the workers and their families the effects will be most welcome. They will move to the country, near their places of work. Once again, as in the agricultural civilization of the eighteenth and early nineteenth centuries, they will have space in which to grow and thrive. Inexpensive homes on large plots of land will be ready for them. The building industry is well on its way to the solution of that problem.

In addition to relocation of homes and the resultant improvement in family life, we can anticipate the use of new materials in the home. Airplane commerce places a premium on weight. We can, therefore, anticipate that furnishings of the home will be constructed of the newer and lighter materials. New light-weight textiles, plastics, aluminum, magnesium, and beryllium are rapidly becoming basic materials.

The art in home decoration will undoubtedly take on an expression of lightness. Expression will be given to the simplicity of the airplane, the colors of the sky, and the freedom of flight. The architectural movement toward integration of outdoors and indoors will be accentuated. The axiom of decentralization will encourage spaciousness in the home.

International Commerce.

We have mentioned that the civilized world has been developed largely along accessible seacoasts. This development has been based to a large extent on the growth of sea commerce. Ocean trade has been fostered by those nations which have been favored by location and resources which made it possible for them to create sea power.

In the opening chapter of the book *The Influence of Sea Power Upon History,* Captain A. T. Mahan wrote:

"The profound influence of sea commerce upon the wealth and strength of countries was clearly seen long before the true principles which governed its growth and prosperity were detected . . . the history of sea power, while embracing in its broad sweep all that tends to make people great upon the sea or by the sea, is largely a military history...."

Captain Mahan proceeded with an analysis of the principal conditions affecting sea power of nations. The points which he makes are important today largely in a negative sense. That is, many of the principles which governed the growth of nations and empires are being eliminated by air power and air commerce, and along with these foundation stones the empires built upon them may fall.

Mahan's principles are separated into six major categories, geographical position, physical conformation, extent of territory, number of population, national character and character of government.

A nation which holds a central geographic position in relation to sea commerce is favored in the development of sea power. Thus, England has held a most envious position in the world from this point of view.

A nation which could concentrate its power was in a more advantageous position than one, such as the United States, which had two coasts to protect. Geographical nearness to the enemy was important for commerce—destroying power such as blockades. Control of the bottlenecks of sea routes such as Gibralter, Suez, Panama, Singapore, Cape Town, and England itself determined sea power.

Physical conformation and extent of territory of countries affected sea power. Numerous and deep harbors were essential. The length of the coast line and character of the ports were vital considerations. Depth of a country measured in square miles was of little importance.

The number and character of the population were important elements affecting sea power. The number of people living along coastal areas who were available for employment in shipping and the creation of naval material was a determining factor. The aptitude of these people for commercial pursuits and for a life at sea was a feature common to nations which have been great upon the sea.

The government of sea powers had to be aimed steadily at control of the seas. As in England, a major emphasis of government was directed at "widening and strengthening the bases of her sway upon the ocean."

A prophesy made in 1737 by Thomas Grey, author of the famous "Elegy" expresses the spirit and ambitions of a sea-power nation.

"The time will come when thou shall lift thine eyes
To watch a long-drawn battle in the skies,
While aged peasants, too amazed for words,
Stare at the flying fleet of wondrous birds.
England, so long the mistress of the seas,
Where wind and waves confer her sovereignty,
Her ancient triumphs yet on high shall bear
And reign the sovereign of the conquered air."

Will this prophesy come true? Or are there factors which might make it impossible for a great sea power to maintain its importance in an air age?

Those principles laid down by Mahan as contributory to the development of nations under ocean trade and sea power must be carefully scrutinized in the light of air commerce and air power. The flexibility of movement of the airplane appears to rule out the possibilities of the control of bottlenecks by any one nation. Obviously, canals and mediterranean seas, sea and land fortresses are of little or no importance when airplanes can fly over or around them at will. Deep countries with completely decentralized production are clearly more defensible under air power than those with long coast lines and industries centralized near huge sea ports.

Obviously, too, in an air-age nation the attitude of the people and their government must be directed toward the development of the air as their basic means of transportation. Without such attitudes and interests, with the airplane treated as a secondary implement of trade, no nation can expect to maintain a world position in their air age.

It seems plausible to consider that nations which become great in the air will be the centers of future international commerce. Such countries may well be those located on the interiors of continents rather than on the sea coasts. The United States, Canada, Russia, Brazil, China, India, and many smaller nations appear to satisfy this criterion. It is interesting to study the resources of these countries with the thought of establishing among them the foundations of international air commerce. Perhaps the direct air routes between the production centers of these nations will in the future surpass in importance such routes as those between New York and London or San Francisco and Singapore.

Then, too, as was previously pointed out, air commerce places a premium on weight. Materials which are shipped by air should be light in weight to command the lowest shipping cost. New raw materials may be expected to replace the older heavier ones. Light-weight plastics, aluminum, magnesium, and beryllium are being developed rapidly. The places where these materials are found or produced will rise in importance as international points for trade.

From an aeronautical engineering point-of-view, there appears to be no basic reason why airplanes cannot handle the freight and passengers which have been carried on the seas heretofore. Eighty-ton aircraft are being built. Engineers have promised planes much larger. There is no known limit to size. The pioneering of new world trade by air is just beginning. It is to be hoped that this new world and the relations among nations will be the result of far-sighted planning and not haphazard growth. It must also be our aim to see that air power is not used for the benefit of a few or for the development of special interests.

Domestic Commerce.

New forms of transportation have always brought about important impacts on the development of industry. Waterways, railroad, and automobiles have each in turn developed new industries, expanded existing industries, and have brought about many changes in the location of factories. These changes in the United States have tended to continually raise our standard of living and influence the development of this nation as a world power both economically and politically. Air transportation will also have a very definite effect on all of these three factors. The flexibility of movement of the airplane will permit the location of factories and industrial plants at the most strategic points. New industries will develop from the use of the airplane, not alone the aircraft industry. New materials are already being developed, and as has been mentioned before, emphasis will undoubtedly turn from the heavy structural material of the railroad age to the new light-weight materials of the air age.

These changes in industry influence the development of the economic and social bases of our national life. They will have a bearing on each individual and on the structure of communities and political subdivisions. It is important, therefore, that every effort be made to anticipate these changes and to plan for them in order that the air-age growth may benefit all of the people. Social and economic planning

of this kind has been most difficult to accomplish in the United States. In this country we have been prone to meet problems as they arise and not to anticipate them. The development of the automobile is a typical example of this situation. The use of the automobile has never been democratically planned. The large number of people moving from urban centers to suburbs, the planning of suburbs for automobile traffic, the inroads of trucking on other forms of transportation, the design of industrial sites for automobiles of workers, the centralizing of automobile industry, the problem of supplying rubber needs, the furnishing of gasoline on the eastern coast during war times — the planning of all these problems has been neglected. This neglect of planning has cost money. It has not been economical and it is one of the reasons for high taxes. Is it possible that we as citizens can make provisions for the planning of the coming air age? Can we see the problems clearly enough to establish direction which will be most satisfactory and of most benefit in the development of the country.

Location of Industry.

A large part of the manufacturing industries in the United States is centralized in the northeastern states. There are good reasons for this. First, water power and coal were available for industrial power in these states. Railroads made more profits on long hauls than on short hauls and this aided in keeping manufacturing in the eastern states where it was first developed. Their rates were favorable to the large cities of the east and this in turn made it possible for the railroads to receive long hauls on agricultural, mining, and forestry products of the west. Labor in the eastern states was cheap during the latter part of the nineteenth century. A tremendous number of immigrants from Europe settling in the eastern seaboard states made it possible for factories located in these points to utilize cheap foreign labor. Other industries outside of the northeastern states were located largely, to benefit by the proximity of raw materials. Salmon canneries on the Columbia River and in Alaska, tobacco in North Carolina, meat packing in Chicago, cheese in Wisconsin, furniture in Grand Rapids — these and many other industries were located in those areas where they originally received their raw materials. In a number of cases this raw material supply is being exhausted and many industries today would probably be better off if they moved to new points. Other factors such as mobility of labor, nearness to markets, concentration of buying and selling, local community investments, and the division of one product among several companies all have had their influence in determining the location of various industries.

Air-transportation's greatest enemy is concentration. This factor acts in two ways. First, transport operation on a large scale, utilizing many airplanes, requires many routes. It is not possible to fly an indefinite number of planes on one radio beam. Close proximity of planes to each other may become a very serious safety problem. Thus, it can be seen that concentration of industry in any one city, when it is using air transportation, may cause congestion which would prevent the full development of

this form of transportation. It is possible that inventions not yet made may assist in overcoming this limitation. At the present time, however, planning must be directed toward decentralization of air transportation, by the elimination of large terminals. The second important point favoring decentralization is that of air defense. The strategy of air war is based on the destruction of nerve centers, including focal points of industry and transportation. An air raid of the future could readily eliminate a center such as Detroit without any more notice than an air-raid signal. Hundred-ton bombers flying from 400 to 500 miles an hour non-stop from almost any point in the world could put one of our cities out of commission in a very short time. Therefore, from a point-of-view of defense it is important to consider the need for decentralization of industry and transportation.

It is entirely possible to have individual landing strips alongside major factories which would handle the traffic for that particular factory. Freight gliders or freight planes could land or take off immediately adjacent to the receiving rooms of the factory. This in turn would not only offer speedy transportation service to industry but would also eliminate the expense of intermediate handling of goods between airports and factories.

Obviously, with the use of air transportation, industry is no longer faced with the problem of location near railroads or markets. The development of electric power transmission has reduced the necessity for location near sources of power. The automobile has made labor far more mobile than it has ever been in the past. Location of raw materials remains as one criterion which may determine the disposition of factories. The major factors which heretofore have determined the location of industry are no longer valid. Under the impact of air transportation there is every reason to believe that we will be faced in the near future with the need for a complete re-planning of industrial areas in the country.

New Industries.

The growth of air transportation and aircraft industries during the past two years has been phenomenal. Although the growth has been due to the need for military equipment, many factories will continue to produce aircraft for peace time. It is anticipated that the aviation industry will be the largest industry in the country within the next two years, as measured in dollars of output. Over two million people will be required to manufacture 125,000 airplanes which are scheduled for 1943. The expansion of the aviation history following the war will conceivably require from two to four times as many workers as are now employed. International air commerce, domestic transportation, materials for a military air force, and private flying will expand the industry far beyond the most fantastic estimates which can be made at this time.

Industries allied to aviation will also grow. Such industries include those which manufacture and fabricate aluminum, magnesium, beryllium, plastics, and fabrics. Oil, rubber, machine tools, engines, radio are, of course, basic materials for aviation and will expand under the impetus of the growth of the industry. The expansion of the aviation and allied in-

dustries should be recognized as the basic element in planning in the air age. Decisions must be made as to the location of industries, their relationships with other industries, and their places in relation to the program for defense against future air wars.

New Materials.

Several references have already been made to new materials which are required in the development of the airplane. Emphasis has been given to the need for light-weight materials. It has been pointed out that in air transportation there is a premium on weight. This is not only true of materials that go to make up airplanes but more particularly the products which the airplane transports. It would be cheaper to transport chairs made of aluminum or magnesium than to transport those made of heavy wood or steel. This means that light-weight products will undoubtedly sell for less money than those which are heavier. It seems reasonable, therefore, to assume that the air age will bring with it an era of light-weight commodities and more careful design of products. To create this lightness will demand engineering skills heretofore in demand only to a limited extent.

Art will be attained through expression of function without any ornateness or unnecessary appendages. It may be that this character will carry into architecture and all artistic expressions. In any event we may be sure that new materials and new methods of utilizing them in design and structure will result from the expansion of aviation as the basic medium of transportation.

There is much to look forward to in the coming air age. There are many responsibilities which youth must accept in planning industry and commerce in order that they may be developed on a sound foundation. By and large, this kind of planning requires deep understanding, knowledges and skills with which to redirect our society and economy. The America of the air age will depend on how well this job is done. It will also depend on the degree to which selfish interests, bent on maintaining positions of power, will relinquish their rights and plan for the future. Planning for the air age is a job for youth — youth well skilled and educated to do the job.

The Challenge to America.

Air power will win the war. Air power can maintain an old-fashioned peace. Air power can make slaves of free men. Air power, any power in the hands of a few, opposes the organization of a completely free and peaceful world. Air power is a condition to the survival of nationalism. Air power is not merely pilots and planes. It is an attitude of mind, a mind seeped in the traditions of power-politics.

Air power has wrecked homes. It has maimed and killed men, women and children. It has served militaristic leaders bent on expansion of power controls. It has sent trade ships to their watery grave. It has brought to all people the threat of air raids from every quarter of the earth. France fell because of lack of air power. Norway and Crete were invaded through mastery of the air. Britain forestalled disaster by brilliant air strategy. Free nations are struggling to protect themselves against the onslaught of winged mad men.

Everywhere there is a demand for more airplanes and more pilots for mastery of the air. Is this Mouillard's "cataclysm" and Tennyson's "ghastly dew"? Or is that yet to come in the sudden, terrible fury of World War III? The answer will be determined by the actions of American citizens.

The conception of world freedom and the guidance toward universal peace is for free men. It is a challenge to Americans — the greatest challenge in the history of civilization. Americans must develop attitudes directed toward living in a world in which flight will be the directing factor of human behavior. The historians of a free world will record with reverence the self-sacrifice and courage of those who have changed their course of living for the benefit of all humanity.

The Roman Empire rose to glory under land power. The British Empire became great by controlling the long trade routes by sea power. America can continue the lineage through air power. Such power will be maintained by war. Air war is ruthless. Will America succumb to the temptation? Do Americans want this kind of air power or will they realize man's age-old dream of winged peace? There has never been a greater challenge to American teachers in our history.

The Merchant Fleet *in the* Air

By JACK FRYE

President, Trancontinental & Western Air, Inc.

VAST merchant air fleets capable of transporting most of the world's cargo will emerge from World War II and may be the key to a lasting peace.

Pointing to that era is the transport plane of today, which is hauling men and supplies on distant missions with the same precision and casualness with which it is carrying passengers, mail and express over domestic airline routes. Its workmanlike performance is portentious of what we can expect of its post-war successor — a larger, faster and more efficient airplane. And it will be this future transport that will write the vivid pages of the air age upon which we have already embarked.

The world has known two great eras since the Middle Ages. The first was born in 1492 when Columbus from the sterncastle of his flagship, the *Santa Maria*, sighted the land of San Salvador in the New World. That historic landfall inaugurated the Era of Discovery which for the next 300 years created through exploration and colonization vast new empires. For the Netherlands, Spain, Portugal, England and France it was a Golden Age — an age which, in the opinion of some historians, saved these countries from decadence.

The second great era was spawned by the Industrial Revolution of the eighteenth and nineteenth centuries. We are familiar with the far-reaching effects of this age — another Golden Age which gave us the steam engine, the steamship, the railway, the telephone, the cotton gin, the telegraph, the reaper, the sewing machine and hundreds of other devices that influenced in one way or another the living habits and standards of most of the human beings on the globe.

There is one thing in common in these two eras of the past. Both were made possible through the medium of transportation. The discoveries of Columbus, Magellan, Cabot, Balboa, Cartier and the others would have been unlikely had it not been for improved sailing techniques and (after Columbus) new navigation methods. The two greatest single contributions of the Industrial Revolution were the steamship and the railway because of the profound changes they wrought on trading, colonization and development of natural resources.

Our own history records the crisis that beset the administration of John Quincy Adams as a result of the sectional jealousies and antagonism which divided the industrial East and the West. The West was clamoring for additional federal help to meet its own expanding needs; the East resisted. Not until the Erie Canal was opened and the first passenger railroad was built did these sectional barriers collapse. They were swept away by new transportation facilities which permitted an exchange of commodities one area lacked and the other had in abundance. It has been on this prin-

ciple of interchange of goods that our nation has grown, prospered and remained united.

The airplane, more than any previous form of transportation, can make all the nations of the world truly united. The airplane knows no barriers, it recognizes no distances. Distances between countries are no longer reckoned in terms of mileage but in terms of time, and time between countries is constantly shrinking as the airplane increases its speed of flight. Measured in time, the world is only a fraction of the size the Magellan expedition found it when it circumnavigated the globe with sailing vessels more than four hundred years ago.

The world will be even smaller, more accessible, when transport planes, freed of the restrictions of war, will begin making regular ports of call to all countries, discharging the goods one nation needs and taking on those things it can sell to its neighbor. Trading will thus be made available to hundreds of localities which have had none in the past because they lacked port, highway or rail facilities. When that day dawns, the world for the first time will have reached a true basis of understanding among nations, just as the East and the West dissolved their differences with the building of the Erie Canal and the first railroad.

There are skeptics who doubt the airplane can fulfill this mission, that it can replace in great measure the functions of the steamship in world trade. To answer these doubters, it may be well to review the history of commercial aviation in this country, for it was in the United States that the air transport system reached the greatest stage of its development.

Ten years ago, the airlines were a struggling young industry. Transport planes then were slow, noisy, lacking in passenger comforts and conveniences. Pilots were handicapped by a lack of the many safety aids which have since been added. The public was prejudiced against flying, considering it "risky" business to step into an airplane. Some people had an inherent fear of height, others shied away because of high passenger rates. When an airplane occasionally came to an unhappy end, the publicity frightened away many potential users who were just beginning to be "sold" on the benefits of air travel. The publicity of the day was reminiscent of the headline appearing in the (now defunct) *St. Louis Post Gazette* of October 14, 1906 over an account of railroad accidents for a twelve-month period: *"Now Killing 26 Persons per Day."*

It is doubtful that any other industry overcame so many obstacles in such a short time as the airlines have done in the ensuing decade. Improved radio navigational equipment and advanced maintenance and operations methods have placed the industry in a safety position second only to buses in the U. S. transportation field.

Figures based on fatalities per 100 million airline passenger miles amounted to 1.2 in 1939, 3.9 in 1940 and 2.9 in 1941. In 1941, according to National Safety Council figures covering all types of accidents, the airline rate of 2.9 fatalities per 100 million passenger miles compared to a rate of 7.1 for the nation's railroads, 6.4 for automobiles and taxis, and 2.0 for commercial buses.

Since 1936, passenger revenues

have risen sharply, each year surpassing the record of the preceding year. In 1936 the airlines carried 1,020,931 revenue passengers and in 1941 the figure had advanced to 3,768,892 revenue passengers. A drop-off this year may be expected as a result of the airlines turning over a number of airplanes to the military services and converting still other planes to military cargo use.

Air mail and air express likewise have shown great gains. According to Civil Aeronautics Administration figures, the airlines flew 5,741,436 ton miles of mail in 1936 and in 1941 the total soared to 12,556,000. In 1936, express ton miles flown totaled 1,860,809, and in 1941 the figure jumped to 5,242,529 ton miles.

The record of achievement of the airlines is attributable to a number of factors but the foremost of these is a rigid adherence to safety regulations which have won the confidence of travelers. In no better way can this be noted than by scanning personnel records which in TWA show 109 employees on the ground for every airplane in the air. And of this number, more than 25 are employed in the maintenance department alone.

The military role of the transport plane in this war was demonstrated for the first time in the German invasion of Norway, when air-borne troops were sent by the high command to occupy that country. It was again demonstrated in the German invasion of Crete, this time with the glider complementing the transport as a troop-carrier. Again in the invasion of Russia did the Germans employ transports to maintain their supply lines to the front. One authority, William M. Sheehan, estimates that between June 22 and October 31, 1941, Nazi transports moved 42,000 tons of supplies a distance of 12,500,000 plane miles in 30,000 trips .

In our own country, the transport plane is just coming into its own as a cargo-carrier, although TWA experimented with an exclusive overnight air freight service between New York and Kansas City as early as August, 1931. Several weeks ago the Air Transport Command authorized the airlines to transport men and supplies "wherever needed" and has promised additional equipment to augment the fleet of cargo planes at present available.

With the theater of hostilities spread over most of the earth's surface, the transport plane, in my opinion, will deliver the materials necessary to deal the decisive blow of the war. In global war such as this, surface carriers are inadequate because of the greater risks entailed in their slower movement to and from distant battlefronts. Our shipping losses to date are mute evidence of these risks.

But what of the transport plane of tomorrow? The answer is that it will be much larger than anything yet built. In cargo-carrying capacity, it will be capable of carrying perhaps up to two thousand tons. It will be able to fly vast distances non-stop. It may take off with a capacity load from Los Angeles and without refueling land at Moscow. Its course will not follow established rail-steamer routes to the east but will go north across the polar cap, the point-to-point route taken by Michel Gromov and his Russian companions in 1937 when they flew from Moskva, Soviet Union to San Jacinto, California, for a non-stop record of 6,296 miles.

Such planes are feasible, even now. The Lockheed Constellations, which Howard Hughes and I conceived and which originally were ordered for TWA, are an example of this type of aircraft. The Constellation's original specifications called for accommodations for 57 passengers and a crew of seven, a range of flight and speed that would bring any capital in the western hemisphere within 16½ hours of the United States. Sydney, Australia, would be brought within 40 flying hours of Dayton, Ohio, for instance, as against 23 days by rail-steamer. Four of these planes, making four round trips each, could transport 1824 passengers between Dayton and Los Angeles in the 56 hours it would take 16 pullman cars to carry 480 passengers one way only. It is this factor of speed utilization that gives the airplane the edge over all other forms of transportation and enables it to outperform the steamship or railroad freight car in tonnage carried over a given period of time.

The future long-range transport planes, like TWA's fleet of Boeing Stratoliners, will be built to cruise at high altitudes to take them over storm areas and extreme mountain ranges. Altitude flying is not new. It has been one of the major problems of scheduled flying from the outset. In the early days of mail and transport planes, pilots had difficulty in clearing low cloud formations which sometimes obscured mountain peaks and at others resulted in icing conditions. As the service ceilings of aircraft were increased, pilots on occasion found difficulty in breathing rarified air encountered above 12,000 feet, due to the decreased partial pressure of oxygen.

To overcome this situation, TWA early in 1935 began investigating engine operation and other flight problems incident to the use of cruising altitudes of 20,000 feet and above.

One phase of the experimental work was carried out by the late Wiley Post, who in a series of high altitude flights in that year contributed considerable information of value to our regular engineering staff which was conducting another phase of the program. For the latter work, we used as a research plane the DC-1, the original Douglas twin-engine transport which we were instrumental in designing.

In the summer of 1935, the DC-1 was flown approximately 20 hours at altitudes averaging 22,000 feet. An oxygen system had been installed which was adequate to supply a crew of four for at least eight hours. In the course of these experimental flights, it was found that the plane could clear 95 per cent of cloud formations when cruising at 20,000 feet. Some clouds were observed, however, to extend to higher levels.

To complete our research, we equipped in 1936 a single-engine Northrop Gamma mail plane with a turbo-supercharger which the Army Air Corps lent us. This plane had a higher service ceiling than the Douglas and it was possible to observe weather conditions up to 36,000 feet. On several occasions it was found that weather which necessitated cancellation of regular transport service could be overcome in the Gamma with perfect safety by flying above these conditions.

For 18 months, TWA operated five Boeing Stratoliners in domestic service. These 33-passenger, 4-engine

transports were equipped with "pressurized" cabins, in which atmospheric pressure was controlled in a way that passengers could enjoy low altitude comfort while flying up to 22,000 feet. Since late last winter, the Stratoliners have been operated for the Army in foreign courier service, but their stay in domestic airline service was long enough to prove the popularity of "over-weather" high altitude flying with the traveling public.

A transport plane, built for long-range flying, will not be restricted to over-weather flying in the future, for certain weather in extreme conditions transcend the ceiling limitations of the highest-flying aircraft. When such conditions are encountered, the airplane of tomorrow will fly "around the weather" even though it may mean adding a few minutes to its normal itinerary.

After the war, the need for long-range, high-speed transport planes will be unquestioned. The entire world will be sorely in need of consumer goods, which in many instances must be transported over vast distances. Starvation conditions are now existing in Spain, Greece, France and other countries because of lack of transport. Shipping losses have been so great in this war that it may take years to replace the lost tonnage of all nations. I seriously doubt that it will ever be replaced completely because transport planes will be able to fill this breach more efficiently and at less cost.

The United States should start now to build up its merchant air fleet which would serve the dual purpose of helping win this war and the peace that will follow. We can use not thousands but tens of thousands of transport planes to carry the war to the enemy and later, peacetime supplies and materials to all peoples of the earth. In addition to employing countless thousands of workers, such a fleet would be insurance against future wars by their immediate availability for military use against would-be aggressors. Had we possessed a fleet of this magnitude last year, Japan would not have dared to attack us, because attack would have meant an almost immediate counter-invasion in force on the island of Nippon.

It is a heartening sign to note the recent interest of educators in the cause of aviation, for unless we can instill a fundamental knowledge of the subject among our youth we will never become a truly great air power. We have been remiss in this respect in the past and our recent attempts to make up for lost time necessarily have come from the top through colleges rather than from the bottom, or through the elementary schools. From present indications, this situation will be corrected in the near future.

It is evident that Germany's success as an air power rests in no small measure on the aviation curriculum she laid down for primary and secondary schools as early as 1934. Hitler and his henchmen did a thorough job in training German youth in all the allied branches of flying, ranging from meteorology and engines to flight instruction and knowledge of aviation in other countries. Even such apparent extraneous subjects as poetry were not overlooked in a decree of the ministry of education, which pointed out that "poetry (of an aeronautical nature) is of special didactical value in conveying the air

and war experience and racial attitude of a foreign nation." Aviation became the bone and sinew of German youth.

American youth should be given the same opportunity, not with any thought of world conquest but to equip them with a knowledge of what aviation means in this war and what it will mean to domestic and world commerce after the war. Many thousands of them will want to become a part of it and the nation and the airlines will need their help in carrying out the enormous expansion of air routes we may expect on the morrow.

The Air Age *and* Teacher Education

By LESLIE R. GREGORY
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THERE are many types of educational institutions in the United States engaged in teacher education. After one pattern or another they undertake this very important educational task. Some of the institutions have as their sole cause for existence the preparation of young people to be teachers in the nation's schools. Others accept teacher education as their primary function and others undertake it as one of several major functions. There is good reason to believe that others engage in teacher education as a matter of convenience for profit, or as an aid to institutional survival.

Because it is impossible to find a simple term descriptive of all of these institutions references in this article to teachers colleges should be interpreted as inclusive of all colleges engaged in the education of teachers. No teachers, regardless of the subject matter areas in which they may work, can free themselves of the responsibilities this new age has placed upon them. And, as these responsibilities rest heavily upon the teachers, they rest doubly heavily upon the teachers colleges. The publicly supported teachers colleges and the colleges of education in the universities are responsible for preparing the majority of the teachers. This condition does not, in any degree, subtract from the responsibilities of any other institutions which undertake to send their graduates into the public schools to teach.

The Air Age is new terminology. The term was first used by a few men in America who were thinking. These men, and the number was small, were able to analyze and to evaluate the effects the airplane has already had upon our civilization. They could see that the airplane had become a machine capable of violently disturbing civilization and also capable of destroying it. The term air age, nonexistent just a few months ago, is now in frequent use. When the full power of the machine is understood the term will be universally used. It is of first importance that universal use come soon, for with it will come understanding.

It is not strange that the common man of our community was slow to recognize that a mere machine had produced a revolutionary age of great dimensions. It was only a few months ago that the airplane was assigned a secondary role even in military affairs, and by military men. We were still reading the descriptions of the new bomb-proof battleships when the flash came announcing that two of them had been sunk in short order by airplanes. The military men had been warned that this would happen

but they did not believe it. The men with vision are unhappy because that which they see so clearly others are unable to see at all.

To those who are accustomed to using it the term air age has a meaning that is deep and real. The accompaniment of its use is a conviction that the airplane will, when wars are won, bring about a change in the lives of people in all parts of the world and of every station in life. Will educators, those who are teaching teachers, be as blind to the future as were those we choose now to criticize were to the new strategies of war? One man of the profession was heard to remark recently, "You men who are so stirred up over this air age business have gone off 'half-cocked'." He fails utterly to see that the airplane is very likely to become — in fact, it already is — the instrument of economic, political, and military dominance.

The term air age is something new. But the "air age," as opposed to being something definitely new is more likely an extension or development of something not so new. That which we have in mind may suggest the contents of the current chapter in the history of transportation. To suggest that the airplane is the latest development in providing transportation does not subtract anything from the claims made that it has ushered in a new age, a new era in history.

The invention of the steam engine marked the beginning of the modern process of speeding up transportation. The steam engine opened rivers to navigation and made possible the agricultural and industrial development of the west. Its effect was to disperse people and, while dispersing them, to bring them closer together. In the field of communication the invention of the telegraph and the telephone gave support to this effect.

The invention of the internal combustion engine marked the next important step in the transportation of people and goods. It powered the automobile, which machine has made a community of America by constantly accelerating the process of moving more people farther apart and away but still bringing them closer together. Interestingly enough, where men go goods go also, and where goods go men engage in trade. It is not necessary here to review the history of the development of the automobile in America. To call attention to its impact on business, finance, population groupings, and most other factors of our composite existence is to indicate the direction our thinking should go when the boundaries of North America are extended to include the world.

The invention of the airplane resulted in the further development of transportation and marked the beginning of the air age. The airplane carries the process forward. It takes more people farther apart yet brings them closer together. The airplane may be made to do for the world what the automobile has done for America — make a community of it. But the airplane is only an instrument for use. What its effect will be will be determined by the objectives, the motives, and the morals of those who control it.

For those who believe in a destiny of mankind that contemplates the bringing of all men together in understanding and good-will, this interpretation of transportation is arresting. Can it be that man shall profit

by the lessons learned from war, and shall, with the assistance of his own inventions, be able to have as his friends with whom he is willing to share, the people in all parts of the world? Such thoughts are suggestive of the opportunity which appears to be present. The implications are clear. The airplane has opened an era which will demand that many of our international relations become intra-world relations.

When this war has been won it will be as if the storm has passed and a new day radiant with promises appears over the wreckage. In many ways this new day will find boundaries removed and barriers of all sorts capable of being removed. Though, today. we must regard the airplane for what it is — the dominant weapon of war — it would be a serious mistake to fail to foresee its possible future peace role. Even now, while it is being used to destroy, it is opening new frontiers. It is charting a new ocean, the sky. In times of peace it will open new channels of commerce and industry. It will offer new destinations to vacationers — all parts of the world. It can be made to bring new privileges to the under-privileged people of the world. It can be the dove of peace that brings greetings from all people. Conversely, and it seems too bad that this note must be struck, it can continue to spread distrust, misunderstanding, want and destruction. When Americans have been as successful in using airplanes for peace as they certainly will be in building and using them in war, then they will have proved that democracy functions.

The way will not be easy although to those whose behavior is other than utterly selfish it is most attractive. It may be expected that when the armistice is signed and before the terms of peace are known nationalistic interests of many sorts will be thrust to the front. Intra-American political and economic battles will be waged relentlessly. "Back to the old order" will be attractively presented. As opposed to those who do not recognize world responsibilities will be those who recognize that our own continued peace and safety are dependent upon the well-being of men in other parts of the world. There will be those who will say yes and those who will say no to the proposition that Americans may need to share their "cuts of beef steak" with the hungry men in Asia, Europe, or Africa. These words are not intended to be prophetic. Rather they are intended to convey the idea that in the future our world quarrels will be community quarrels. The airplane has brought our back yards close together.

This article does not undertake to give support to its broader generalizations by citing bits of evidence of what the airplane has done and is capable of doing. However, it may be worth while to note some of the major modifications it has wrought. For one thing it has changed the Arctic Ocean filled with ice into an arctic air ocean filled with ships. It has completely altered the Pacific Ocean in so far as political alignments, trade, defense lines, and international relations are of concern. When these two situations are studied the urge to study is self-generated.

It is a matter of interest and a challenge to the imagination that the airplane will take people from a given nation to any other nation well within

a day's time. Airplanes capable of doing that are now a reality. It is not enough to behold with wonderment this marvelous machine. It is not enough to compliment man's ingenuity. It is not enough to visualize new prosperity to result from this new stimulus to exchange. It is more necessary that men direct their ingenuity toward and examination of their political, social, and economic cross currents which are surely in the offing to result from this free intermingling.

It is such considerations as these that require the thinking of teachers college faculties. It is not so important that Americans in great number will be traveling to China, Japan, India, and Australia and perchance to take up residence there for indefinite periods. Nor is it so important that the people of those countries will be coming to America. But it is important that attempts be made to foresee what the possibilities of such intermingling are for conflict or for peace and understanding. The differing cultures, religions, and philosophies and their influences in shaping political viewpoints and actions, trade practices, and general international attitudes will need to be understood, and respected, or, conversely, opposed.

Obviously the teachers colleges have obligations with respect to the air age that are of the present moment. Before devoting their full energies to getting ready for a future which will be different they must give all they have to give in disposing of this nasty business of war. In June the teachers colleges were requested to act immediately by preparing high school teachers in service to teach aviation courses in high school. The response was excellent. It was suggested to them at the same time that they — with teachers in service — submit the whole school curriculum to the conditioning influences of the air age. The response has not been too encouraging.

It is imperative that teachers colleges continue with these two assignments. The war is not won. It will not be won till our people understand and are able to use the modern implements of war. There can be no "cooling off" with respect to these duties. Teachers colleges must continue to pour their full resources into creating a reservoir of technically trained men for the armed services of the nation. They must also work to air conditioning of the American people.

Teachers college faculties will, if these things are done well, lay the foundation upon which they may continue to build when the war is ended. Teachers colleges have those heavy responsibilities which accompany a strategic position. They now occupy one of the most important and most strategic positions in American life. They are preparing the teachers for the nation's schools, upon which, more than any other institution, the future of American civilization depends. If there are any groups in America that should be alert to social changes in process those groups are the teachers college faculties. They should be the first of all people to recognize emerging influences which promise to effect, in a major degree, the current modes of living.

Faculties are not expected to have the power to foresee startingly new developments in the form of inventions. Certainly Thomas Edison did not foresee that the little recording disc he invented would, on a future date, be the center of a dispute be-

tween union musicians and the largest national broadcasting companies. No teacher could be expected to foresee the invention of the internal combustion engine or of the airplane. But the airplane is here and many of its effects are visible. It is reasonable to expect that from what is already seen we begin to prepare for that which logically must follow.

Teachers colleges faculties, alert to their responsibilities in ending war and maintaining peace will, even in war, start preparations for the maintenance of peace. To be ready for war is to get ready. To be ready for peace is to get ready. There is no gain in saving democracy in war and then losing it in peace. As a nation we were not ready with the war plane. Shall we be ready with the peace plane?

The "Air Age" presents a golden opportunity to the teachers of teachers. It is an opportunity to show that education can keep apace with social progress. This opportunity will be lost if teachers college faculties undertake to supply the demands of the air age by undertaking specific changes in curricular offerings before they have acquainted themselves thoroughly with the larger implications of this new age.

The Supply *of* Teachers *for* Aviation Education

By EDGAR FULLER
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THE problem of teacher supply is the most difficult obstacle to aviation education in the elementary and the secondary schools. Much of this kind of education is new, and there is no backlog of qualified teachers. Moreover, those who are best qualified to give the instruction are in great demand for teaching other courses, for war industries, and for the armed services. Unless aviation education is to be neglected, it is obviously necessary to take extraordinary measures to provide teachers for it. What teachers are needed? Perhaps we can discuss this question best by referring to what aviation education will require of them.

At the outset, we should clearly distinguish the two great tasks that face the teachers in aviation education as they modernize the curriculum and bring the many implications of the air age to their students. One of these tasks is that of producing a general awareness of the age of flight and its social significance. This problem confronts the teachers of all subjects in all grades of both the elementary and the secondary schools. Most of them will respond by inserting materials on the air age in such regular school subjects as geography, social studies, mathematics or English. They will teach global geography; they will make certain that the political, social and economic effects of the airplane are understood; they will teach the mathematics which is in common use by airmen; they will suggest collateral readings in English which will have the incidental effect of educating the students in the changed world that the airplane has brought upon us. But teachers won't do these things for their students unless they, themselves, understand what the air age means to all of us. Many do not have that understanding now. All possible in-service training procedures of school systems will be necessary, therefore, to redirect the teaching in all grades so that constant modernization of the curriculum in terms of the air age can be achieved. We must make clear what may be done and give the teachers special assistance in doing it. If most of the teachers then use appropriate aviation materials in most of their classes most of the time, the general "air-conditioning" program will be a success. This is a long-range and general curriculum revision program of the utmost importance.

A different task confronts many high school teachers. Much of the high school aviation education must be taught in specific courses, for other-

wise the content will be too widely disseminated among other courses to be obtainable by a student or will be omitted altogether. Some of these courses, such as those on construction and maintenance of airplanes, are related rather closely to the traditional courses in industrial arts. Where entire courses relate to aviation, the industrial arts teachers who have been assigned to them usually have done creditable work. When reliance has been placed upon inserting some units on aviation into the traditional courses in industrial arts, however, some teachers have unfortunately preferred to teach the construction of tea tables or bookends rather than that of model airplanes. Such teachers, who unreasonably resist change and rely too much upon traditional materials of instruction, may well be retrained during service in order to give aviation its proper place in the industrial arts program. This is true whether or not there are regular courses in aviation industrial arts as such.

Other requirements on the high school level demand thousands of instructors for new courses. Fundamental courses in aeronautics will be offered to boys and girls in thousands of high schools this year. They will be added to the educational program as full equals of academic physics in recognized importance and academic respectability. The industrial arts aspects of aeronautical education are limited by shortages of both teachers and workshop facilities, but pre-flight aeronautics can be offered in both large and small high schools and without extensive laboratories. The only real limitation in this field is the shortage of properly qualified teachers, and this limitation is less serious in fact than many would lead us to believe.

Considerable progress has been made in training teachers for basic pre-flight courses in aeronautics. During the past summer, many took the Civilian Pilot Training ground courses. Workshops and courses in colleges and universities also had large enrollments and many will continue this training for teachers who live nearby during the coming semester.

Certain administrative devices will help. There are some available teachers, both men and women, who are pilots. Many more can be located who have had ground-school experience. Administrators may arrange to use the talents of these persons whether they are regular teachers or not; central agencies can certify them and local school authorities can employ them and pay them well enough to retain their services. One qualified teacher may often serve several high schools; on the other hand, some large high schools may use several teachers in a single course, each conducting the part that lies nearest to his regular teaching field.

In spite of these preparations during the past summer and these administrative devices to increase the supply of instructors, some teachers will offer pre-flight aeronautics this year who have had no special work in aeronautics. Can these courageous teachers succeed, and thus uphold the judgment of the courageous administrators who ask them to do it?

According to the experiences of a considerable number of teachers last year, the answer is that they can succeed. Efficient teachers, with an interest in aviation and a background of scientific education, can teach high

school courses in the fundamentals of aeronautical science successfully. They have remarkable opportunities to improve their instruction as they teach. Workshop groups, city or regional associations of pre-flight teachers and other informal associations for self-help can be formed. Teachers' aids and materials in both subject matter and methods are abundant. Correspondence or extension courses may be of assistance. Regular CAA instructors' ratings may be obtained in the principal fields by passing examinations in subject matter and teaching methods, and these will stimulate self study because, although requirements are high, no courses or credits are required for admission to the examinations. Some teachers will find opportunities to fly, to visit aircraft factories, or to otherwise acquaint themselves with the facts of aviation. Sometimes they will even learn much from certain of their students, and the ability thus to learn is one of the most certain marks of teaching efficiency. Altogether, teachers of the fundamentals of aeronautics have no reason to fear their task. Their subject is desired by the students and is not resisted by them in the sense that traditional subjects often are. All their preparation for good science teaching can be utilized in the teaching of pre-flight aeronautics.

The theme of all war-time conferences of educators has been similar. It runs something like this: We are fighting a technical war. Our educational system has been caught short because it was educating for peace and not for war. We need more technically trained persons. We especially need more technically trained men, ranging from engineers to the millions who must be dependable in simple mathematics in order to perform their war duties. We want *more* and *better* mathematics and physics taught *better* to *more* people, in order that applications of these learnings can be made as part of the war effort. We also need basic courses that will teach certain things directly without waste of time, such as pre-flight aeronautics teaches the fundamentals of the ground work in aviation. This means that we must add courses in the technical fields and get increased enrollments in those courses we already have. The experience of the past year shows clearly that pre-flight aeronautics courses increase the enrollments in the regular mathematics and physics courses. We thus need more mathematics, physics and industrial arts teachers, as well as a new crop of teachers of pre-flight aeronautics. Then comes the chorus — where do we get the teachers?

We all know there has been a rush by the armed services and by the war industries to enlist technically trained persons. Now we have a shortage of science, mathematics and industrial arts teachers, at the very moment when the armed services and war industries have become most insistent in their demands. We lack these teachers because the armed services and the war industries have taken them from us. What are we educators going to do about it?

We won't do much of anything until we change some of our complacent and outmoded ways of thinking. Lamenting our plight in beautiful speeches avails nothing. We must cast out some of our educational shibboleths and face our task directly. We are nearing the bottom of our bar-

rel of manpower. Unused talents and training along mathematical and scientific lines can be found in almost every school system and in almost every community. These talents should be utilized.

We cannot afford to operate our schools now, according to the trappings of an outworn academia. Prerequisits, sequences, credits, time schedules, absurd teacher certification requirements, and antiquated teaching rituals in academic subjects based on the psychology of formal discipline will have to be violated during the emergency. Central agencies will certify and local schools will employ persons who have not had their required course in, say, the techniques of curriculum integration. If some of these evidence of educational inferiority complexes never return, our educational system will probably be better after the war. We need to stop complaining about the teachers we do not have and begin utilizing to the utmost the larger resources of teaching talent we have thus far left untouched. We want the best teachers we can get, but we must have teachers.

Above all, there must be a spirit of daring and a willingness and determination to succeed. Show us a good teacher with some scientific training and aptitude, a high school principal who is progressive as an educational leader, and a superintendent who really comprehends public policy in these times, and we will see a potentially successful course in the science of aeronautics, even though the teacher has no special training in aeronautics as such. We must use such combinations as this after the supply of specially trained teachers is depleted. Such a teacher will succeed if the educational administrators will give him reason to believe that he may be able to succeed and will afford in-service training opportunities. The teacher's realized limitations are likely to make him more effective than his colleague who has grown lazy in his subject and imagines that he already knows all the answers.

Aviation *in the* Elementary School Science Program

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THE teaching of aviation as a part of the elementary school science program is based on three assumptions: first, that it is desirable that teachers and children grow in their understanding of airplanes and aviation; second, that much pertinent material is already included in accepted courses of study and other works on elementary school science; and third, that new material is more readily accepted by a learner if it is related to old material.

The teaching of aviation in the schools is often defended on the grounds of the current national emergency. The line pursued by some educators is somewhat as follows: "The enemies of the United States have scored victories as a result of air superiority. We must secure air superiority over them. Great numbers of airplanes must be built and manned to do this. It is a function of the schools to help in producing pilots, mechanics and factory workers to fill the pressing need for them."

While this argument undoubtedly has validity for the secondary school, from which under present conditions many students will proceed into airplane factories or into the armed services, it seems a little far-fetched when applied to the elementary school. Some further justification must be sought for the teaching of aviation in the elementary schools.

There are, however, larger issues involved than merely meeting an emergency which, one hopes, will be over by the time our present sixth graders reach combatant age. It is a basic belief of the writer that aviation education in the elementary school is justified by the nature of the airplane itself.

Every now and then in the history of the world, man gets hold of an invention whose effect upon society is so far-reaching as to produce in effect a social revolution. The wheel was such an invention. So was the printing press and the steam engine. So also was the generation and widespread use of electric power. Probably the cheap automobile was such an invention, and certainly the airplane is.

With the rise of modern aviation, man for the first time finds himself able to ignore both natural and artificial boundaries and barriers between regions on the earth. For the first time, men are able to travel from one place on earth to another by way of the shortest and most direct route, without transfer from one type of vehicle to another and without regard for mountains, coast lines or other obstructions. Starting from any point

* Author of "Elementary School Science for the Air Age," Macmillan Co., New York, 1942.

on the globe, man can go wherever there is air to carry him. And as though freedom from barriers were not enough, man can make the journey at great speed.

Since the dawn of civilization men have, in practice, reckoned the distance from one place to another in terms of time. Now we have in our possession a means of transportation so swift that no place in the world is more than two or three days' journey away.

The airplane, then, emphasizes as no other device has done the essential interdependence of men and nations.

The airplane has possibilities as yet undreamed of by the average person as a transporter of goods and materials. It is altogether possible that in the not distant future airplanes will provide as cheap transportation, pound for pound, as do our present-day railroads. This aspect of airplane operation is as yet scarcely touched upon.

A program of aviation education should have as its objective something more than merely the development of "air-mindedness." Air-mindedness connotes a tendency merely toward blind acceptance of the airplane. Many people are already very air-minded. What the schools must do is to change this fact of mere acceptance into an actual understanding of airplanes and their operation appropriate to the age, interests, and experiences of the learner. This state of understanding of airplanes and aviation is what is meant by Secretary Hinckley's phrase "air-conditioning." If nothing else, the schools can help to break down some of the misconceptions and downright fictions about aviation which are now prevalent in the minds of many children and many adults as well.

It may happen that in the excitement and hysteria of the war period an attempt may be made to introduce "Aviation" into the elementary schools as a new subject, perhaps displacing some other subjects. This would almost certainly be a grave mistake. It would be about as silly to study airplanes as a separate subject for elementary school children as to study "Tanks," "Battleships," or "Long-range Guns" as separate subjects. Aviation is a part of a world picture; understanding of aviation should grow in the child as a part of an harmonious growth in his general understanding of the nature of the world. More specifically, since this article is particularly concerned with the science program, it is felt that a study of airplanes should merely be one part of the whole program of elementary school science.

Airplanes fly because they react in a certain way with the air. They are driven by engines which are converters of energy. One of the most important factors with which a pilot must contend is the weather, which in turn depends upon the behavior of air under various conditions. There are other flying organisms besides man, and they are adapted for flight in a variety of ways.

Now the nature and behavior of air, the various forms of energy and its conversion from one form to another, and the adaptations and variety of living creatures have been included in many if not all of the better courses of study in elementary school science. Such authoritative works as those of

Craig[1] or Croxton[2] mention a number of understandings, meanings, or learning elements to be derived from a study of air, machines, and living things. It is not the writer's purpose to introduce a new and perhaps difficult subject into the already overburdened curriculum of the elementary school, but rather to indicate a new stress or a different emphasis upon material much of which is already in the curriculum.

It is felt that a major contribution which those concerned with the development of the science curriculum in the elementary school may make is to show wherein many of the meanings or learning elements in science which have been accepted by authorities as being suitable for development with elementary school children may help in a growth of understanding in regard to airplanes and aviation.

Of late years the study of the globe has been somewhat neglected in American elementary schools, and indeed in all American schools. Yet today we are fighting a global war; a war in which we are concerned with airline distances and directions from one point to another. Before the advent of the airplane, people were largely concerned with east-west directions because these were the practicable sailing directions for surface ships. The far north and far south were neither practicable sailing routes nor habitable lands. They were largely left out of the thinking of ourselves and the people of the lands with which we were accustomed to deal. This east-west thinking is reflected in the character of the maps with which most of us are familiar.

Now, due to the characteristics of the airplane, it is no longer necessary to travel mainly east or west over the surface of the earth; one may just as easily travel north or south over the polar ice caps.

The school globe is an ideal device for determining the shortest air route from one point to another, for a string stretched between the points in question automatically gives the true great-circle direction and by merely measuring the string and multiplying its length in inches by the scale of the globe the true distance is determined also.

Children should be encouraged to determine the great-circle (airline) distances and directions between the places about which they read in the newspapers.

The elementary school is an excellent place to get across to children the idea that man is only one of a multitude of flying creatures. There are many classes of animals which fly. Among these groups are insects, birds, bats, flying squirrels, flying fish, etc. There was even a dinosaur, the Pterodactyl, which flew. Children are always interested in prehistoric animals; this is a place to lay a little stress on the flight aspect. It might be a worth-while project to trace through pictures or museum trips the development of flight through the ancestors of the modern birds.

In the plant kingdom also there are numerous examples of flight ranging from the spores of molds and toadstools which are carried by the air to the air-borne seeds of the ash or maple.

Observations of natural flight will

1 "Science for the Elementary School Teacher," by Gerald S. Craig. Ginn and Company, Boston, 1940.
2 "Science in the Elementary School," by W. C. Croxton. McGraw-Hill Co., New York, 1937.

help the child to give man his place in the scheme of flying things. The school should try to give the child the idea that flying is as natural as any other of man's activities. When children are truly "air-conditioned," a person who can pilot an ordinary private plane should be no more an object of special interest than a person who can drive an automobile. Just as the locomotive engineer, the steamship captain or the driver of a military tank is a figure of special interest to children, so would be the transport or military pilot; not merely because he can fly, but because of the special type of machine he operates.

Children need to begin thinking of the air as a real and integral part of the earth. Like many another big scientific idea, this is one in which people can grow in their understanding all their lives. It is not too early to begin to get children to accept it in the kindergarten. At a very early age children may have simple experiences to show them that air is real; that it has weight and inertia the same as any other real substance. Such experiences may range all the way from feeling the resistance which air offers to a fan in the kindergarten to a study of the principle of the mercury barometer in the sixth grade. Very little of this is new; some of it has been in the elementary school for a hundred years.

The atmosphere has a structure; it is not merely a formless mass of gas. The troposphere or layer next to the earth is the part of the atmosphere in which vertical circulation takes place. It is this vertical circulation which gives rise to storms. Above the troposphere is another layer, the stratosphere, in which storms are absent. It is in this storm-free layer that the long-distance flights of the future will probably take place. Already the warplanes are penetrating the stratosphere as a matter of course. Because of the cold and the low air pressure, stratosphere flying brings with it its own problems. Teaching about the structure of the atmosphere will prepare children to deal more intelligently with those problems. Probably few of the children will become aeronautical engineers, but the elementary schools will have made their contribution if they have helped to build an informed and intelligent understanding of stratosphere flight on the part of the public.

The lift of an airplane depends upon the movement of air over the curved surface of the wing. Long ago a man named Bernouilli discovered that if a stream of fluid of any kind is forced to constrict, its velocity is increased and the pressure within the stream is decreased. In the airplane a stream of air, generated by the swift forward motion of the machine, is forced between the curved upper surface of the wing and the relatively undisturbed air above, thus creating a partial vacuum. The pressure of the atmosphere tends to force the airplane into this partially evacuated space, which results in a lifting effect as long as the plane has forward motion.

This sounds rather complicated, but there are a large number of simple experiences with Bernouilli's Principle which elementary school children may have which will not only prove satisfying to them on their level in answering their questions about airplanes, but which will lay a foundation for a more rigorous study later on. A number of such experiments

may be found in the present writer's *Elementary School Science for the Air Age.*[3]

Actually in explaining why an airplane rises, Bernouilli's Principle is the only learning element, if such it may be called, which is not already stressed in most courses of study in elementary school science.

One of the principal differences between aviation and other modes of travel is that surface vehicles, either on land or water, are controlled in one dimension only; that is, they may be steered to left or right and that is all. Airplanes, on the other hand, must be controlled in three ways: they may be turned to left or right, pointed up or down, and tilted sidewise.

Probably three-fourths of the whole art of flying consists in exercising correct control over the plane in three ways at once. If children in the elementary school are made conscious of the problem of control in three dimensions the task of the flight instructor will be simplified. Even if the children never try to become pilots, their understanding of aviation will be increased. Since, when man is deprived of vision, he has no senses which enable him to maintain three-dimensional control, instruments have been developed to give the pilot additional "senses" which he must use when the ground is hidden by clouds or fog. Much training is needed at present to use these instruments. A great deal of talk is heard at present among those who do not realize the kind of problems involved in bad-weather flying, about the time when airplanes will be as common as automobiles. Until some simpler means of bad-weather flying is found than the instrument flying in use at the present day, "blind" flying will be confined to a relatively few highly-trained pilots. The everyday private pilot must probably remain on the ground during bad weather for a long time in the future.

Until some means is invented so that people with a moderate amount of training can fly in bad weather, the private airplane will be analogous to the private yacht or motorboat rather than to the private automobile.

An activity which should not be overlooked in the "air-conditioned" elementary school is that of simple model-building. Unfortunately, much which has been written concerning model building could not be more discouraging to an elementary school teacher if it had been written with that end in view. It is true that models are constructed which cost $100 or more and would do credit to an aeronautical engineer. It is also true that a model of sorts may be made from a folded sheet of paper. In a casual survey of a five-and-ten-cent store recently nine different model kits were seen, ranging in price from two for five cents for little gliders to fifty cents for a rubber-band-powered flying model.

In a good many cases children need nothing more positive from the teacher than permission to go ahead. Elementary schools, however, ought to go further than this; they ought to provide positive encouragement in the form of time and a few simple materials and tools for model building. Shop or industrial arts teachers should help the children by providing plans

3 "Elementary School Science for the Air Age," by Charles K. Arey. The Macmillan Company, New York, 1942.

and suggestions. The school authorities should secure a place such as an open field where the children may fly kites and model planes and encourage model contests. A child who constructs a model which flies well has had an excellent (and painless) lesson in aeronautics which he could have secured in no other way. Teachers who wish to embark upon a program of model building should not be ashamed to learn from the children.

Hardly a word needs to be said about a study of weather. The weather has been a topic of study in the elementary school for years. It is of such extreme importance to aviation, however, that the aviation angle of weather needs to be stressed much more than it has been. As a matter of fact the aviation angle makes weather vastly more interesting to children than it formerly was.

The many activities around a modern airport offer an ideal subject for study in the elementary school. Field trips may be taken to see the many operations which must be performed before a modern airliner may take off. Wartime regulations will no doubt curtail the number of things which people may be permitted to see, but a good deal still remains at most airports. One first grade recently made an extensive study of airports culminating in the erection of an airport in the classroom. The airport was equipped with camouflaged buildings and airplanes flying in and out suspended from strings on pulleys. Here in one activity was a social study of the men who work for us at airports, protective coloration and camouflage, and simple machines as exemplified by the pulley arrangement — all on a first grade level.

Approaching *the* Air Age Through English

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THE air age which is already upon us has forced a critical examination not only of our traditional concepts of the world in which we live, but also of our traditional concepts of the educational curriculum. In a rapidly changing, three-dimensional world centered around a highly complex industrial and technological economy the outmoded values of a two-dimensional world order built on a relatively simple agrarian economy, hold neither validity nor reality. Older notions of a static world society firmly rooted in a static world geography have had to be abandoned for a more dynamic concept of human and cultural life upon this planet. National systems carefully organized and nurtured for centuries on geographical and cultural barriers have crumbled and disintegrated, or been swept away entirely under the impact of air power. Political, social, economic and cultural isolation have become so many myths. By its achievement of speed in transportation and communication, the airplane has brought a smaller, more interdependent world order closely integrated in a dynamic and globe-wide whole. The development of aircraft has thus revolutionized our whole concept of cultural life upon this planet.

In so doing, it has also revolutionized our whole concept of the educational curriculum. In the last analysis, the curriculum of the schools is a preparation for the curriculum of adult cultural life and a reflection of the values of adult society. When the foundations and values of a society change, it is incumbent that the educational curriculum change with them. Should the schools continue to lag behind cultural progress, and adhere to a traditional curriculum built around vanished ages and values, then they become not merely contributors to educational inefficiency but actual barriers to effective social operation. Education must change as society changes if it is to discharge its social obligations effectively. This will mean that obsolete traditions must give way to emerging new concepts. The dynamics of twentieth century society must become the focal centers for the curriculum of twentieth century education.

In an epoch as critical as the one we now face, where the destinies of all nations and peoples are at stake, and where the fate of democracy and freedom hangs in the balance, the responsibilities of democratic education are doubly grave and all-determining. Teachers and educators everywhere must accept as their unique function the interpretation of present world society, the examination of those dynamic factors and forces which have

* Author of "Flying High," Macmillan Co., New York, 1942.

molded twentieth century life and operated as directive influences on twentieth century institutions. They must foster those understandings and knowledges which will contribute to the greatest social efficiency, human welfare, and cultural progress. There is no better starting point for the accomplishment of these objectives than through the medium of aviation education, for the air age has ramified into every aspect of cultural life upon this planet and profoundly changed the course of all human activities.

This concept of modern society and of the modern school curriculum has definite implications for the teaching of English. It calls for a new orientation in English based on a new philosophy of aesthetics. Hitherto we English teachers have ascribed to the philosophy that English is a Classical "Art." We have approached the study of literature from a two-fold perspective. First, we have held that literature should be studied as "pure" and fine art, as something intrinsically valuable in and of itself, something rare, unsullied and detached from present life. Secondly, we have been guided by the theory of universality. We have held that the greatest literature is timeless literature, that the greatest writing is writing which applies to all ages and that therefore this universal literature is superior and preferable to the literature of a particular era, including the present. By the acceptance and application of this dual philosophy, we English teachers have frozen the study of literature into the study of a "pure" and static art. In so doing, we have had an unfortunate effect on the reading habits of generations.

This traditional and static concept of the English curriculum must give way to a more functional and dynamic approach. The philosophy of Pure Aestheticism, of art-for-art's sake, will have to yield to a philosophy of Functional Aestheticism, of art-as-an-expression of life. The study of literature should be viewed as the study of significant presentations and interpretations of modern cultural life. The subject matter of the English curriculum should be made living and functional; its materials should provide those basic knowledges, understandings, attitudes and skills which enable maximum effective operation in present societal life. This means that English will provide not merely study of the literature of by-gone ages, but will include a significant sampling of the literature of the present age. This new functional and dynamic philosophy of English Teaching gives greater scope and value to the English curriculum, for it does not exclude former significant literary experiences but rather adds to them emerging new and vital areas.

Among the new materials which must be added to the English curriculum, none are more significant than the materials of aviation. The literature of the air age provides a new center of interest and a new area of living around which to shape the English curriculum. It serves to give a new reality to the language and literature experiences of boys and girls in the English classroom. Units of work can be organized around major centers of interest and major aviation topics. The following units are suggested:

1. The history of aviation, tracing the dream of flying from the myths and legends of earliest peoples up to the scientific successes of the present.
2. The pioneers of aviation, treat-

ing the lives of dauntless visionaries from Daedalus and Icarus through the era of Da Vinci, then on into the modern age of the Wright brothers, Admiral Byrd, Amelia Earhart.

3. The experiences of aviation, providing contact with all phases of flying and with the sensations, thoughts and feelings which accompany flight.

4. The social effects of aviation, covering the cultural, commercial, geographical, military, and sociological implications of the air age.

5. The universal aspects of aviation, treating the meteorological and natural phenomena affecting flight; and

6. The vocational opportunities of aviation, providing a survey of the important fields of work which aviation has opened to men and women.

Each of these units can be built to include literature of every type. Poetry, essays, and articles, biographies and autobiographies, short stories, narratives, and book-length fiction, drama radio plays and motion pictures all can be drawn upon for significant materials relating to aviation. As diversified a range is possible as the myth of the flying horse Pegasus, the Romantic poetry represented by Shelley's "The Cloud," the modern autobiography of Admiral Richard E. Byrd, and the contemporary best-seller novels of St. Exupery. These are only examples. An effective blending of the various literary types can also be achieved. The serious and often tragic sagas of early fliers can be balanced with the many humorous and successful adventures which abound in the annals of aeronautics. Every Icarus has his counterpart in Darius Green; every Amelia Earhart is offset by an Amy Johnson.

Major units centering around the air age are also of especial significance in the opportunities they afford for a truly meaningful approach to the reading problem. The literature of enjoyment can be functionally interrelated with the literature of information. Reading for pleasure can be stimulated and at the same time flow over into reading for comprehension. For example, a narrative or poem about Dr. Piccard might lead to further reading on his scientific investigations of the stratosphere. An account in poetry or prose of a first solo flight might lead to reading on how to become an aviation cadet. Selections on the social effects of aviation would inevitably lead toward a critical study of the bases for modern war and modern peace. As simple a poem as Carl Sandburg's "Fog" might lead to a scientific study of the meteorological phenomena governing weather and the formation of clouds, storms and fog. On the other hand it might easily serve as an excellent introduction to the further study of Carl Sandburg as a poet. The possibilities for the utilization of these aviation materials are as endless as the English teacher's vision.

These experiences with reading for information and for pleasure will lead in turn to richer intellectual and language activities in the classroom. Word study, oral and written communication, critical thinking, aesthetic and creative expression, meaningful personal and group activities will naturally follow as an adjunct to significant literary experiences. Through the medium of aviation literature, the study of English can thus be made a pathway to the fullest exploration of language and life. This is the promise of the literature of the air age.

The units here suggested in avia-

tion literature also make possible the utilization of English as a unifying core for the entire secondary school curriculum. They provide for systematic correlation with every department of the secondary school. Experiential learnings in the social sciences, the physical and natural sciences, in health education, art, vocational and shop training, even in extra-curricular activities, all can be fused and integrated in the English classroom so as to provide a rich and meaningful body of school experiences. This process in turn facilitates the functional utilization, in other departments of the curriculum, of basic language controls and conceptual understandings acquired in the English classroom. Such functional interrelationship is of immeasurable importance in providing for effective learning and meaningful application. Aviation materials thus afford English the unique opportunity of serving as an integrating center for all secondary school subjects.

To this end, anthologies of the literature of aviation have been prepared. These provide source units of collected reading materials on aviation. These units are organized around the centers of interest previously suggested. They include literary materials of every type and every age, and cover a wide range in diversity, difficulty and depth. These selections are so arranged that they can be used singly in the classroom, or else in the sequential pattern in which they have been placed. The choice is one for the individual teacher. Every selection is accompanied by a series of instructional aids. These include: an introduction providing the basic factual understandings and the purposive mental set necessary for effective reading; a vocabulary list including pronunciation and meanings, based upon the language used in the selection; a series of suggested topics for discussion, and related follow-up activities growing out of the preceding selection. In addition, each major source unit is provided with an introduction of its own, giving a general over-all picture of its purpose and contents. Included at the end of each anthology, is a fully annotated and very comprehensive bibliography of books, periodicals, films and radio scripts relating to aviation. These are intended to serve as a suggestive guide to further study and exploration of the air age.

All of the materials discussed above are included in two anthologies, *Flying High,* by Rose N. Cohen and *Wings for You,* by E. A. Cross.*

For English teachers who want further direction and guidance, a valuable and detailed introduction is provided as a preface to each anthology as discussing instructional procedures, purposes, and methods. These anthologies have been prepared by practising English teachers for practising English teachers, with actual classroom conditions constantly kept in mind. It has been the endeavor of these editors to provide such units and source materials as will be of maximum service in the English classroom in making an effective approach to this significant air age, and in furthering the highest values inherent in English teaching. Source materials are of value, however, only insofar as they are utilized by teachers actually working in the classroom. It is the earnest belief of this writer that forward looking English teachers will not only recognize their opportunity but will welcome and seize it.

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The Social Studies Teacher *and the* Air Age

By HALL BARTLETT*
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WHAT has the social studies teacher to do with aviation instruction? The chances are that not one in a hundred teachers can fly a plane and it is likely that many of them have never even been up in one. Moreover, most high school pupils appear to be more conversant with aviation than are their teachers. Thus the social studies teacher may counter this first question by asking another, "But how can I teach about aviation when I know nothing about it?"

The answer to both questions is that the social studies is concerned not with the technicalities of aircraft but rather with the impact of the airplane upon our social, economic and political structures. Consequently, while a technical knowledge of airplanes and their operation is desirable, such are by no means prerequisite to the teaching of social studies for the air age.

A few simple examples in terms other than aviation will serve to make clear that any adequately trained teacher of the social studies has the necessary equipment for taking on this new responsibility. Housing is a fairly common topic or unit of study in Problems of Democracy courses. Yet the teacher is not an architect or a carpenter, a stone mason, plumber or electrician. But does this deter the teacher from dealing with Housing in his classes? Neither is the teacher an octogenarian, but this does not prevent him from taking up the problem of Old Age along with other aspects of social security. He may not be a seaman, but he takes up problems concerning our merchant marine in his classes. Moreover, the teacher may have had no experience as a worker in industry, but he includes labor problems in his lessons. He brings all of these varied topics into his teaching because he knows that they form parts of the pattern of American life today. Such teachers will agree that the airplane, too, has its place in this pattern.

But suppose it be argued that travel by air is restricted because of high cost, limited facilities, the element of physical danger—or the apparent unwillingness of some people to fly because flight is "risky." These limitations obtained in the early days of the automobile. But more recently it has been one of America's boasts that we have one automobile for every five people. Costs of automobile manufacture and operation have come down. Highways and other facilities have been provided, too often belatedly, for our increasing automobile traffic. The individual who refuses to

* Author of "Social Studies for the Air Age." Macmillan Co., New York, 1942.

ride in an automobile today is regarded as something of a crank.

Is it unlikely that the airplane will overcome, to a very great extent, these limitations which were once advanced as the proof that the automobile would never be really practical? Consider the matter of costs in aviation. The average rate per mile, 5.03 cents on our domestic air liners in 1940, was about the same as Pullman car charges per mile. Light planes, designed for private ownership and operation, could be bought that same year for the same or less money as a medium-priced car. Moreover, such planes are built so that they are easy and inexpensive to fly. And they are certainly as "foolproof" as the automobile. In fact, the safety record of America's private fliers is equal if not superior to that of the car drivers. And on our scheduled air liners, both domestic and foreign, the fatality rate per million miles of actual flight in 1940 was less than four-tenths of one percent!

Passenger traffic on our domestic air lines alone grew from about 663,000 fare-paying riders in 1935 to more than 2,700,000 in 1940, the year before we entered the war. During these same years privately owned and operated airplanes about doubled in number. All of these facts seem to indicate that the American people have been taking to the air more and more over the past few years. This conclusion, together with the tremendous expansion in aircraft production and operation, and in trained industrial and operational personnel brought about by the war, indicates striking post-war development of civil aviation. There will probably be at least 100 planes by then for every one we had in 1940. Trained pilots by the thousands will be available. A huge aircraft industry, already splendidly equipped, will be eager to produce planes for peace-time civilian use.

By way of example of what the future holds for civil aviation, consider the war-time expansion of air transportation. In 1940 we had 440 transport planes in service on our domestic, territorial and foreign lines combined. At the end of the war there will be thousands of big planes available for both passenger and cargo transportation. One builder alone, at this writing, has offered to construct 5000 giant airplanes to be used as cargo carriers. Aviation engineers state that huge planes such as these can carry goods at about six cents a ton mile. This rate compares favorably with that for heavy auto truck operation. Recently, one of our great air lines announced that it will provide *hourly* trans-Atlantic service by air in the very near future.

What possibilities do these facts hold for post-war America? Teachers must find a way to prepare their students for the immense changes that the airplane is bringing about. Space does not permit mention of more than a few of these implications. Can a teacher dealing with a unit on "The Good Neighbor Policy" overlook the part played in our foreign relations by Pan American Air Lines, the "Good Neighbor Who Calls Every Day"? What class can have any realistic discussion of the problems of the peace unless the airplane, not only as a weapon of attack, but also as an agent of post-war international trade, be thoroughly considered? Read between the lines of proposals for post-war economic readjustment and ob-

serve where commercial air lines may play a significant part in the problems of distribution of goods and in the exploitation of areas inaccessible to surface transportation. Can any agreement as to "freedom of the seas" be made without recognition of a new doctrine, "freedom of the air"? Such are some of the implications that the airplane holds for international affairs.

The impact of the air age upon domestic conditions is quite as complex. The movement for urban decentralization under way long before the war will be accelerated by the airplane because air transportation is inexpensive, rapid and safe. Moreover, postwar conditions may dictate that our vital industries be decentralized to protect them from aerial attack. Should widespread decentralization come about it is obvious that new, though smaller industrial communities will come into being. What realignments in taxation and in real estate values are likely to develop out of such shifts in population, housing demands, school facilities, surface transport and the like? Our rural areas seem destined, in the air age to lose their isolation and to become integral parts of great metropolitan communities which will lie in overlapping, concentric circles throughout the nation. To what extent will railroad and other surface traffic diminish? Railroad, truck and bus officials are studying this question. It would seem sensible that the holder of surface transport securities do likewise.

It requires no "Buck Rogers" to anticipate how the airplane is likely to change all such relationships. Said an air line executive in March, 1942, " . . . with the airplane we have been able to reduce the United States, measured in terms of time, to the size of the state of Pennsylvania." Proportionately the entire world is smaller in terms of the time required to travel from place to place. Last spring, for example, a young man sat at a desk in a New York office on a Monday morning. He had left Karachi, India, by plane on the previous Thursday.

What do such contractions of time and space mean to business men, diplomats and professional people of all kinds? A wider domestic and international commerce seems assured; the greater facility of travel now available should enable statesmen to settle troublesome international matters around the conference table as such difficulties arise; aerial commuting between nations enables the exchange and promotion of ideas and a greater intellectual internationalism should develop. Furthermore, large-scale international civil air traffic requires a high degree of coöperation between nations. This, by itself, is a significant step toward greater unity among countries.

Placement of Content.

Any adequately trained teacher of the social studies, as has been said above, has the necessary basic training to teach air age social studies. Assuming a reasonably flexible curriculum the teacher can introduce many special units about aviation into the social studies program. Such topics as the history of aircraft; air power in World War II; influence of the airplane upon the local community; international aspects of aviation; the airplane and changed geo-

graphical relationships, and the like readily suggest themselves. On the other hand, some teachers may prefer to augment existing units of work by adding materials about aviation to them. In general this latter procedure is, in the writer's judgment, more logical since aviation exists not by or of itself but rather in its relation to all of the elements of society. Only in this complex relationship can the implications of the air age be seen.

In geography classes time and place relationships must be taught in terms of the airplane's speed of 300 miles an hour or better with a payload of a box-car and the ship's ability to land almost anywhere. How these facts change our concepts of central Brazil, the heart of China and of Africa, of northern Canada! All these vast areas until recently have been closed, but now, with the airplane, their markets and untapped resources are open to exploitation. Twenty of the giant cargo planes now being built by Curtiss-Wright for the United States Army could have done the work of 4500 trucks in the Burma Road region. And at the close of the war we will have probably thousands of speedy, big cargo-carrying planes such as the Curtiss Commandos.

What person can study a world map or globe in the air age without realizing that "great circle" routes are the shortest distances between two points. Such doubters, if any there be, will discover that the most direct route from Tokio to the Panama Canal lies by way of Alaska and the great plains of our own West. Study of a globe should convince even the skeptic that the Arctic region looms as the crossroads of the world. Seaports lose, in the air age, some of their old significance. Centrally located cities such as Chicago or St. Louis may become actual ports of entry for air-borne international traffic. The Atlantic Ocean is no longer a body of water some 2000 to 3000 miles across, traversed by speedy surface vessels in four or five days' time. Instead, the Atlantic is a narrow lane of water over which shuttle transport planes by the score in less than a day's time. Surely these facts mean that we must change some of our concepts of geography and not only in terms of national defense.

Civics classes should consider some of the functions of the Civil Aeronautics Board and of the Civil Aeronautics Administration. Federal control of civil aviation transcends state lines and exercises wide authority within the states. There are reasons why the federal government assumes such wide jurisdiction and these matters might well be discussed in the light of increasing air traffic and consequent extension of regulation. How can the state aviation commissions coöperate with the CAA? Local problems arising out of aviation should likewise be considered in the civics class. The question of ownership of the community airport and discussion of airport zoning regulations might well be utilized as an approach to other problems of the air age.

Teachers of world history classes will find much rich, worthwhile and stimulating material in the history of aviation. There are many early legends touching on flight which can be incorporated into the history of ancient times. Later, between 1300 and 1800 A. D. much speculation and experimentation about flight took place. The 1800's saw great advances in

lighter-than-air-craft and the airplane itself came of age between 1903 when the Wrights made their first flights and 1927 when Lindbergh's lone passage of the Atlantic gave aviation a tremendous upward boost. Teachers using the chronological approach to world history can introduce much of the history of aviation as the course unfolds. "Air-minded" pupils could be encouraged to take on some of this responsibility. Teachers who use the institutional approach to world history would add aviation's story to the unit on transportation.

The history of aviation in America can readily be added to existing courses in American history. The story is relatively brief and can cap the account of transportation in the United States. Biographical reports can be used for the earlier history and the statistical data in the World Almanac would come fairly close to telling the rest of the story. Particularly significant, in the writer's opinion, would be some consideration of the growth of our air lines between 1920 and 1940. This account would, moreover, serve as a logical step toward introducing the part our foreign air lines play in our international relations. It would also serve to introduce the question of aviation and the peace settlement assuming that this topic is included in some courses in American history in the secondary school.

It has been said above that the airplane does not exist by itself but only in relation to all the other elements of society. This point should govern any consideration of aviation in all social studies classroom situations. However, it may be found expedient in Problems of Democracy classes to provide a separate unit on the general subject of the airplane's impact upon society. This unit might be taught toward the end of the year by which time the students should have acquired some sociological perspective and perception. Such a unit might be divided into three broad areas; the airplane and the local community; the airplane and the national scene; the airplane and international problems.

On the other hand, the teacher might find it better to "sift" aviation implications into other units in the Problems class. If this were done, it would seem that some kind of preliminary discussion of the airplane's many implications would be essential. Teachers are familiar with the apparent inability of many senior high school pupils to see implied relationships in what frequently are very simple and obvious situations.

Finally no analysis of community planning can be complete without definite consideration of the affect the airplane will have upon the immediate locality. A survey of the community in terms of the air age would make a stimulating, worthwhile project for an energetic high school group. Such a project, properly organized and directed, should be of value to the entire community.

In all of the typical social studies courses in our schools today there is great opportunity to introduce materials pertaining to aviation. The emphasis should be placed on how the airplane affects, or is likely to affect, the world in which we live, to the end that the young men and women of tomorrow will have some perspective to guide their thinking about the air age. It is so much more sensible to look

the door of the barn before the horse is stolen than to wait until the damage has been done. It is a cliché to say that social science lags behind physical science but it is time that we realize that "without vision the people perish." Third dimensional transportation is here. We must prepare to meet it and its attendant problems intelligently and with foresight.

Teaching Aids.

In these days of reduced budgets school administrators are quick to balk at curriculum changes or additions involving further costs. But they will discover that much can be accomplished, at little or no added expense, by the wide-awake, imaginative teacher of air age social studies.

Newspapers and magazines will supply much information. This, if properly used, can furnish the major portion of the necessary source material. The Sunday editions of larger newspapers have special sections given over entirely to aeronautics. The better magazines frequently have articles about aviation. Many periodicals devoted entirely to aviation can be purchased at newsstands. *The World Almanac* annually gives some seven or more pages to aviation statistics. The Civil Aeronautics Administration has much material available at little cost. The reports of the National Resources Board, available at nominal cost, will be of great value in dealing with the wide problems of decentralization, state and local planning and the like. Air lines and the aviation industry often provide valuable materials merely for the asking. School and local libraries, to say nothing of the loan facilities provided by many state libraries, have much material that is of definite application. Encyclopedias sketch aviation's history. Texts on sociology, economics, economic geography and transportation will suggest many implications. *The Reader's Guide to Periodical Literature* and other such general indexes offer necessary help in locating magazine articles and pamphlets about aviation.

Teachers interested in developing visual aids for use in their classes will find that aviation statistics can readily be presented in graph and chart form by adept pupils. Air age maps for class use can be drawn by enlarging the many such maps as are appearing in our newspapers and magazines. The pantograph can be used effectively for this purpose. Lack of a polar map can easily be overcome by detaching the conventional globe from its frame or pedestal. Great circle routes can be traced and measured, without damaging the globe, by using scotch tape and string.

With such ample materials,—newspapers and magazines, *The World Almanac,* the free maps, charts, diagrams, pictures and other aids distributed by the aviation industry and the air lines, (including many 16 mm. films), — an excellent start can be made. Boys and girls today are motivated already so far as aviation is concerned. Are their teachers as aware of the air age?

Orientation *in* Aviation Through Industrial Arts

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READERS in education have long accepted the point of view that the primary function of industrial arts should be the orientation of youth to a highly industrialized and technological society. Society, however, tends to change rapidly, especially in times of stress like the present. Educational practices, which would have been perfectly geared to the needs of youth ten years ago, may today, be hopelessly antiquated. It is fundamentally important, therefore, that the content and methods of industrial arts should be kept fully abreast with current developments in science and industry. This point of view was expressed by a group of graduate students at Ohio State University, who wrote:

The Industrial Arts teacher and his programs, in order to keep pace, have the responsibility of being aware of social economic changes no matter where they are, and of introducing a balanced transition of change in keeping with the times.

It must be evident to even the most casual observer that the world is now passing through a period of change, the magnitude of which is almost beyond the scope of human comprehension. A foremost feature of this revolution relates to the development and continuing improvement of the airplane. Man, who for ages, envied the birds their power of flight, has now surpassed them. He has found a new dimension. One turns in vain to history to find a development so full of possibilities for far-reaching effects upon the destinies and way of life of all people. Not since the discovery of the use of metals in a world where only stone had been used for tools and weapons, has there been such a significant development.

Education cannot ignore the fact the list of books at the end of this ar— a different world. It is the teacher's responsibility to make sure that students are not afraid to fly. They should be led to look upon flying as a natural means of transportation. The fear of leaving the earth which has been built up through centuries, must be eradicated in a single generation. The industrial arts teacher will play an important part in this program.

Education for the "air age" will doubtless take two forms. First, there will be a gradual introduction of subject matter dealing with aeronautics into all branches of the curriculum. Thus, science, mathematics, social studies, art, reading, and all other subjects will be enriched and vitalized by

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the inclusion of information about aviation and flying. This approach is highly desirable and necessary, but unless the program goes farther, it can never expect to tap youthful enthusiasm which springs from actual participation in aeronautical activities. Industrial arts must, therefore, provide for a full, rich program of laboratory experiences.

If, as appears necessary, America must be "air conditioned" in a single generation, aeronautical instruction cannot be limited to the junior or senior high school or to the elementary schools. Surely, it must have important emphasis on every grade level. Beginning with the first grade and continuing through the senior high schools, there are unusual opportunities to promote industrial arts activities which deal with aeronautics. A few suggestions for these are indicated in the following sections.

The elementary school. Aeronautical activities for the elementary school are of three general types. First, there are those which may be made a part of regular units of work. For example, a unit on "the community" might include a study of the local airport or the need for such facilities. This might call for the building of a model airport as a sand table project. Runways, hangars, signal towers, and landing lights could be constructed by the pupils. In a like manner, a study of transportation might culminate in the making of a plane in which one or two children could sit. This would provide opportunities to teach the names and functions of the various parts of a plane. Instruction in reading, writing, drawing, and arithmetic could also be centered around such a project.

At a somewhat higher level, a study of the history of aviation could be carried on. This might involve the making of models of historic planes, making a study of buoyance in connection with toy balloons, making sand table scenes of historic flights, and the drawing of historic planes.

A unit on the construction and flying of kites might be considered. Besides the actual building of kites, the pupils can be taught many fundamental principles of aerodynamics through this activity.

Teachers in the elementary grades should examine every unit which they prepare for opportunities to include information and constructional activities dealing with aeronautics and flying. This will tend, not only to vitalize the study, but will make a valuable contribution to the desperate need for "air conditioning" all children.

A second means for teaching aeronautics in the elementary school is through the making of model planes. Simple model building can be started in the very lowest grades. Give a boy or girl in the first grade some pieces of wood, a hammer, and some nails, and the chances are that the child will build something, which to him represents an airplane. Teachers should foster and encourage this urge. Even the crudest model presents opportunities for teaching about aviation and airplanes.

For the sake of continuity, it is well for teachers to work out a sequence of models based on difficulty of construction. The first models will need to be very simple. A simple paper glider has been found suitable for first or second years. Detailed instructions for building these, and many other types, may be found in *Aeronautics*

in the Industrial Arts Program, a publication of the "Air-Age Education" series by the Macmillan Company.

The second model in such a series might be an all-balsa glider. This will give experiences in working with a new material, and will have better gliding qualities than the paper type. Pupils in the second to fourth grades should be able to master the necessary tool techniques for making this model.

After pupils have successfully made and flown a balsa glider, they are ready to experiment with flying models. It is well to make the first model of this type from balsa so as to avoid the introduction of too many new materials and operations at one time. Plans and instructions for making all-balsa flyers may be found in most of the books listed at the end of this article or in the manual mentioned above. In addition to simplicity of construction, the all-balsa model is much more rugged than the paper-covered type and is almost certain to fly if properly adjusted.

The most difficult feature of the first flying model is the carving of a propeller. The teacher will do well to secure a good set of instructions (such as are given in *The Complete Model Aircraft Manual* by Hamilton,) and master the process before trying to instruct the class.

Next in order of difficulty after the all-balsa flyer is a paper-covered model. Any one of hundreds of such planes may be chosen. Care is required, however, that it be within the ability of the pupils. The "phantom flash" described in *Aeronautics in the Industrial Arts Program* is well within the ability of fifth to sixth grade children.

If, in the upper grades, certain pupils, because of unusual interest and ability, wish to build a model which looks more like a real airplane, a small cabin model such as the one shown in the above reference, or the AYA No. 4, is suggested.

The construction of a series of models such as this should provide the basis for a broad program of instruction. In addition to the manipulative techniques involved, it furnishes the opportunity to teach the simple principles of flight and aerodynamics. Every pupil should know why and how a plane flies. They should know the forces acting on a plane in flight. All of this can be taught naturally and easily by any teacher who is willing to devote time and study to the problem of model building.

A third activity which may be carried on in the elementary school relates to the construction and use of experimental equipment. Many simple devices are within the ability of pupils of even the lower grades. The basic principles of aerodynamics may be taught with a section of a paper-covered air-foil attached to a board with a piece of tape. This may be made by any average pupil and can be used to emphasize the fact that an airplane is lifted primarily by the passage of air over the wings rather than beneath. This is only an example of many such pieces of equipment which can be devised: Others which may be made successfully in elementary schools include a globe stand arranged so that the globe may be rotated in any direction to indicate air routes between countries or cities, toy balloons to teach buoyancy, weather vanes to teach about wind directions, and simple fan-type wind tunnels.

A program in the elementary school which comprehends activities of the three types described above, should make an effective contribution to the essential need for orienting all children to live in the new "air-age" into which the whole world is now moving. The most serious problem involved in achieving this end is arousing all teachers to the desperate need for immediate action. Every teacher should accept as a personal responsibility the necessity for making whatever preparation is required to begin instruction at once in this essential area.

The high school program. Aeronautics must become an important feature of all high school industrial arts courses. Basically, the problem differs but little from that of the elementary school. The work must be made more difficult to challenge the ability of the older students but the type of activity will be much the same.

Model building may be made a part of almost every industrial arts course. Regardless of age, the beginner at model building should start with a very simple type. The all-balsa glider makes an excellent first project for the junior or senior high school student who has had no previous experience. The sequence suggested for the elementary school may then be followed before progressing to more difficult models.

For the boy who is already adept at model building, the whole field of scale model building, gas models, U-control, and radio controlled planes is open. Each of these provide opportunities to test the ability of the most skillful, and the basis for teaching still more about the laws of flight.

The increased skill and ability of high school students makes possible the construction and use of many additional pieces of experimental equipment. Most of the usual tool processes can be taught in the making of such projects as a flight trainer (see plans in *Aeronautics in the Industrial Arts Program*), wind tunnels, lift and drag indicators, thrust testing devices, anemometers, air-speed indicators, and many others.

For schools which are suitably located and equipped, the building of full-scale gliders also offers unusual opportunities for practical work in the field of aviation. While the building and certificating of such crafts are now subject to rigid restrictions and regulation by the Civil Aeronautics Administration, there are indications that measures to promote their construction in school shops may soon be effected. Unusual opportunities for professional and financial advancement undoubtedly await the alert industrial arts instructors who take immediate steps to prepare themselves to teach glider construction and flying. This is the logical step from advanced model building to actual power flying.

Industrial arts may contribute still further to aeronautical orientation by providing courses dealing with the operation, care and maintenance of the airplane power plant. A study of the design and structure of the full-sized airplane suggests still other possibilities.

Whether or not industrial arts teachers avail themselves of the opportunities which are presented for leadership in the field of aeronautical instruction depends largely upon their ability to make the necessary prepara-

tion. The need is so great and the time so short that special courses are out of the question. It, therefore, becomes the personal problem of every teacher to devise means for securing the required skills and information. The steps in such preparation are briefly:

1. Develop an interest in airplanes and flying. Read airplanes, talk airplanes, study airplanes. If he has not already done so, he should take a ride in an airplane. Attend air youth club meetings and contests.

2. Start building model airplanes. Begin with simple models and *gradually* progress to more complicated types.

3. Fly model airplanes and study their reactions. Learn to adjust them for most effective flight.

4. Secure some simple explanation of aerodynamics and learn the principles involved.

5. Start aeronautic activities in industrial arts classes and learn with the pupils.

6. Sell the program to the school administration and the community.

This plainly is not a job for the teacher who fears to break with tradition. Neither is it a program for the instructor who sees in it only another burden added to an already heavy load. But, for the real leader of youth, it offers an opportunity to show the path to a new world — a world in which all must fly.

SELECTED BIBLIOGRAPHY OF AERONAUTICS REFERENCES

Air Cadets of Canada—*Theory of Flight*, Toronto, Sir Isaac Pitman & Son. This is one of the finest books on Aerodynamics available for Public High School work.

Air Youth in America—*Youth in Aviation*, Yonkers-on-Hudson, D. Appleton Century Co. 1941. A handbook for club leaders and teachers. Deals with the teaching of model building, club leadership, etc.

Brown, Willis C.—*Airplane Models and Aviation*, New York, D. C. Heath, 1942, 43 p., 48c. Contains plans and instructions for making model planes. Also a simple discussion of the theory of flight. Bibliography. Plans and illustrations.

Friskey, Margaret—*Wings Over the Woodshed*, Chicago. Albert Whitman & Co. 1941, 32 p. A story for the lower elementary grades. Illustrations suggest an interesting project.

Grant, Charles Hampton—*Model Airplane Design and Theory of Flight*, New York, Jay Publishing Co. 1942. An authorative work on the design of model airplanes.

Hamilton, Edwin T.—*Complete Model Aircraft Manual*, Dodd, Mead & Co. 1938. A guide to building and flying airplanes powered with rubber motors. Instructions for building and equipping model planes.

Hunt, Leslie L.—*25 Kites That Fly*, New York, Bruce Publishing Co. 1929, 110p. A book for the Elementary and junior high schools. Describes how to construct and fly kites. Full constructional details are given. Kites are rated on their flying ability.

Johnston, S. Paul—*Horizons Unlimited*, New York, Duell, Sloan & Pearce, 1941, 354 p. A graphic and interesting history of the development of aircraft. Clearly written and well illustrated. Upper elementary and high school.

Lenski, Louis—*The Little Airplane*, New York, University of Oxford Press. A clever little story for lower grades.

Petersham, Maud & Miska—*The Story Book of Aircraft*, Philadelphia, The John C. Winston Co. 1935. Tells the story of man's efforts to fly, beginning with the early legends and coming down to the present time. Well illustrated.

Pope, Francis & Otis, Arthur S.—*Elements of Aeronautics*, Yonkers-on-Hudson, N. Y., World Book Co. 1941, 660 p. $3.40. A basic text in Aeronautics suitable for senior high school or college.

Reed, Helen S.—*The Airplane Ride*, Boston, Charles Scribner's Sons. Good supplemental reading for lower grades.

The Pittsburgh Press—Junior Aviation Squadron, *Model Aeronautics* from the Ground Up. Pittsburgh, Pa. n. d. 12 p. Contains plans for making three well designed model planes. Models are correctly engineered and instructions are excellent.

Tracy, Chas. (Ed.)—*Junior Aviator Manual*, Cleveland, O., The Cleveland Press. Plans and instructions for making a number of simple model planes and gliders. Instructional material is especially well adapted to the elementary school level.

Washburn, Stanley, Jr.—*Bamboo to Bombers*, Chicago, Albert Whitman & Co. 1941. A book for the elementary school describing the development of the airplane. Illustrations suggest projects which may be made by pupils.

Winter, Williams—*The Model Aircraft Handbook*, New York, Thomas Y. Crowell Co. 1941. A complete manual for the model builder. Explains all processes fully. Appendix contains plans for several models.

Wootton, Frank A.—*How to Draw Planes*, New York, The Studio. 1941, 64 p. Shows how to draw planes in various positions. Should be very helpful for Ind. Arts teachers who require drawing in connection with their work.

Yates, Raymond F.—*Model Gasoline Engines*, New York, D. Appleton Century Co. 1941, 235 p. An excellent reference for a model gasoline engine.

The Future *for* Aviation

By R. DIXON SPEAS

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MUCH is said today of the glorious future for aviation in the post-war era. During the last war also much was said of the glorious aviation future for post-war days. In 1918 the National Advisory Committee for Aeronautics reported, " . . . the civil and commercial uses of aircraft in the future may be considered unlimited . . . " recommending the general terms of legislation designed to most effectively encourage the development of aviation in the United States. After the last war, however, aviation stagnated for seven years with practically no new airplanes produced during that period of time. Reason? The warehouses were full of airplanes which could be used for almost any purpose of the day and it was considered that these planes should be used before more were built. The same can happen today. Flying fortresses and long-range patrol planes can be converted into cargo and passenger planes. Such a conversion is entirely possible, and as a passenger you would feel impressed with the efficiency of air transportation, just as yesterday's air passengers realized the advantages of air travel. At the same time, the military liaison and private planes of yesterday are doing a wonderful job in today's army and the factories are turning them out like hot cakes. Tomorrow's private pilots can still use these planes as they did yesterday.

The use of today's military airplanes for tomorrow's air era, however, would stagnate American aviation and force this country into a back seat for a long time in the future. Why? Because today's mass production bombers are in reality yesterday's inefficient transport planes. One of the four-motored bombers is identical in basic wing design and structure to an air liner which has been flown commercially for several years. At the same time another bomber represents the same airplane which in the design stage was turned down several years ago by the air lines in favor of another design. All this is not to be taken as lack of respect for these bombers which today are proving to be the world's best. Rather it is to say that development of commercial planes may forge ahead of the military plane development. Such was the case as we entered the present World War. Because of this reason, we must not allow the military planes of today to become the standard transport planes of tomorrow.

It will be necessary, however, for the military planes of today to be used for a transition period. That is to say, we cannot afford today to do other than devote our entire energies to the construction and operation of the world's largest and mightiest military air fleet. At cessation of hostilities it can then be seen that military planes will constitute practically the

only available source for airplanes to be used commercially or privately. We must therefore convert these military airplanes for use during the transition period while new and more efficient airplanes are being developed and produced by the manufacturers. It is important that this transition period be as short as possible.

The only way that America can carry the world's cargo is for America to have the world's best airplanes. That is to say, the nation with the most economically operating airplanes will have a basic advantage in competition with foreign carriers. It can then be seen that as the air lines are provided with airplanes specifically designed for passenger and cargo work, they can then favorably meet any outside competition. The cargo of tomorrow is going by air because of basic advance in air transportation and the nation which most fully develops economical air transportation will carry the world's commerce. Unless we put tomorrow's airplanes in service tomorrow, we will have to take a back seat in future transportation.

The family air car of tomorrow. How long until it will come? We must wait for years if we are to use up all available military liaison and training planes. Surely there will be enough of them after the war for almost everyone to have one, but if you get one it will take a month to learn to fly and another month before you will want to take your family along. It will cost you a couple of day's salary to take a good Sunday trip and the upkeep will be terrific.

Yes, there are tremendous developments being made in aviation today just as there were tremendous developments in the last war but we must not let these developments waste away in the laboratory while we use up yesterday's airplanes. The first job after the war must be during the transition period when a comprehensive review of the war developments and a practical utilization of these developments must be made to design the most efficient transport planes that can be bought. This development must be as intense as today's development of military equipment and the factories must be made ready for mass production of the biggest and best air liners, both cargo and passenger, that can be put into the air. Similarly, the sport car of the air must be developed to the most efficient and safest degree possible and production methods so devised that large quantities can be economically produced.

By so doing, you will be able to take two weeks in the West Indies or Hawaii on a $100 travel budget, and you can go on those week-end vacations in the mountains or at the shore in your own plane. Then commercial cargo and passenger travel of the world will also follow. They will travel on American wings and the world will be drawn closer together by wings of peace just as today's wings of destruction have been the predominant war weapon.

As has been said, the transition period from war to peace will naturally find large commercial use being made of today's military airplanes. During this temporary adjustment period the manufacturers must retool for peacetime production because no production effort can be aimed at tomorrow's peace until today's war is won. We must, however, consider how the war planes can be most effectively used

during the transition period, probably two or three years, and we must keep a running picture of how today's wartime research and development can be effectively applied to our peacetime needs. We must consider a balance between the operating problems and design problems of tomorrow's airplanes so that the resulting combination of American designed airplanes being operated by American companies will constitute the world's most efficient transportation system.

What then if we truly develop and produce the finest and best possible airplanes? All data on super airplanes which can be developed from today's strenuous war effort is naturally considered restricted information at the present time. Leading airplane and engine designers have indicated, however, some of the accomplishments which they feel possible in future airplane design. Airplanes carrying 1,000 passengers at speeds of 200 miles per hour and super speed transports with speeds of over 400 miles per hour seem probably for the not too distant future. Such airplanes will allow express services of less than eight hours on transcontinental flights and less than two hours for New York to Chicago trips. At the same time the 1,000 passenger planes may be expected to operate at considerably less cost than yesterday's ocean liners. Thus we have the super speed small transports for business and emergency travel purposes and the 1,000 passenger airplanes for luxurious and economical passenger travel.

The cargo airplanes may be expected to follow in the same general category, with new sport planes providing the long-heralded "family car" of the air. Because of the restricted information status, it is not possible to consider extensively the performance characteristics of the family car of tomorrow. The pre-war development of helicopters by Sikorsky and others gives obvious promise of tremendous possibilities. American ingenuity when concentrated on air power as it has been during the war period, can be fully realized if post-war airplanes are designed and produced for national air superiority.

In considering the potentialities of air travel, we should not limit our thoughts to the extent of present travel habits. We should not assume that in the air era we will continue to go an average of 50 miles for a week-end visit, 400 miles for your summer vacation trip, and 2,000 miles for the ten-year vacation trip. Rather, we will realize that with the air era our week-end trip may be increased to 300 or 500 miles, our annual vacation trip will become 2,000 to 3,000 miles, and our ten-year vacation trip will extend to any part of the world. Such an increase in travel length corresponds with the experiences of our forefathers when they changed modes of travel.

The fulfillment of the full potentialities of the air age rests with the American people in the establishment of national policy and with today's student in assuring the carrying out of this policy. American youth of today are thoroughly capable of keeping America ahead in the air age of tomorrow. The youth of another nation were prepared over a period of years for the military air age of today. The initial success of this nation in its military conquest is a striking example of the importance of youth education. We must without fail impress

our youth with the important role which aviation will have in the future destiny of this country. The airplane designers and airline operators of tomorrow are now being taught in the schools of today. The opportunities and responsibilities of today's educators are therefore great indeed.

In summation it can then be said that the youth of today of less than military age must start preparing for America's battle of tomorrow, a battle for a lasting peace which will find the world a neighborhood in the long-heralded air age. Wings of peace must be made to replace the wings of destruction, and just as surely as this war has been largely determined by air power, so must a lasting peace have its foundation laid with strong aviation facilities for bringing the peoples of this world closer together.

Youth *and* Valor

By PAUL R. MORT
Professor of Education
Teachers College, Columbia University

IN war or peace, we fly or die. The challenging truth of this statement cannot but be driven home to one who looks at the new maps that the age of air has created for us. Canada and Mexico are like broad beaches on our northern and southern borders. The oceans have narrowed. Darkest Africa has become a pathway to Asia and Eastern Europe. Our ramparts reach from the Aleutians to Australia. Tens of thousands of planes now built for war will be the successors to the few hundred transports of a scant two years ago. To other lands in peace we will be close bound like the nations of pre-war Europe. The students now in our schools will be first the backbone of the air force that must assure the winning of the war and the backlog of trained personnel to maintain our place after the peace.

Because of the very limitations of the human body in high flight and in rapid change in flight direction, the crews of the fighter and bomber planes now being built in such numbers must draw upon youth out of all proportion to the number involved. The boys now in the high school will be fliers out of proportion to their numbers.

Two Groups Face the Issue.

These are the essential facts in barest outline that lay back of the interest of the group drawn together as an advisory committee on education by the Civil Aeronautic Administration to project the work already well developed by that agency in the College Civilian Pilot Training Program. They are the facts that caused a group of persons who had seen what had been done with boys of high school age in England and Canada to band themselves together as the Air Training Corps of America that they might assist in helping to give similar preparation to American boys for the fateful task that lay inexorably before them.

The two groups moved into this field quite independently. The Civil Aeronautics Administration encouraged the educational advisory committee to project a program covering not only the ground school part of the training of air crews but also the general conditioning of pupils of all grades of the elementary and secondary schools to live in a three dimensional world. A program first projected late in December, 1941, was under consideration by the authorities in Washington when the Air Training Corps of America Incorporated was organized as a voluntary non-profit corporation and set to work to develop as extensive a program in the preflight field as possible.

ATCA Leads Out.

The Air Training Corps envisioned not only training in the science of

aeronautics but also military orientation, guidance, physical conditioning, medical examination, the correction of remediable defects and testing of achievement. The present writer was detailed to enlist a group of schools in carrying out an appraisal and development project during the spring of 1942. About the middle of February the problem was put to a group of school superintendents from New York City and surrounding school systems. Their interest in undertaking the task of preparing materials that could be used by the schools throughout the nation was most encouraging. As a result all interested were invited to send representatives to a meeting called a short time later and certain other schools were invited so as to assure representatives from all types of high schools. The group took up the work energetically. In less than a month a survey had been made of all books and syllabi available and, with the assistance of representatives of the Assistant Secretary of War for Air and the Assistant Secretary of the Navy for Air, the detailed subjects to be treated in the fields of aerodynamics, structure, engines, navigation, meteorology, safety and communications were selected. The next step was to assign each subject to from three to seven schools for the actual instruction of boys so that available instructional material could be appraised in actual practice and a basis could be laid for the preparation of new materials where needed. At the same time the men directing work in these schools went to work as a committee to prepare manuals on guidance and administration. With the help of army representatives a preliminary manual on military training and orientation was developed, and the services of physical education specialists were obtained to develop a manual in physical training and forms for medical examination.

Responsibility Re-allocated.

The work was only well begun when the authorities in Washington obtained funds to carry out in considerable part the program prepared by the advisory committee's sub-committee on research. After the work on general air conditioning had got under way under Dr. Engelhardt's direction and the series of field conferences had been launched under the leadership of Dr. Ben D. Wood, the authorities in Washington arranged to take over the science of the aeronautics phase of the development program outlined above and the central staff working on this phase of the program was shifted from the auspices of the Air Training Corps to those of the Civil Aeronautics Administration Aviation Education Research Project. In spite of the shift the two parts of the pre-flight program were carried on by the group of coöperating schools working as a unit. The actual classroom instruction in the science of aeronautics together with the appraisal of existing materials and finally the preparation of new materials was carried on by the teachers of these subjects working with the Aviation Education Research Staff while the materials on administration, testing and guidance, and the work in military training, physical education medical examination was carried forward by the local directors instructors in military training and the central staff of the Air Training Corps Research Project.

Naturally in the work in the schools and in the general administration of the two research projects there was necessarily a great deal of interplay. Those concerned with the work were interested in what could be done to help American boys face the inevitable and inescapable task before them rather than in the exact source of the funds that went to pay for their materials or for the assistance of the central staff.

The Coöperating Schools.

Twelve schools, public, private and parochial, made up the group that undertook the task of appraising existing materials and developing needed materials. These schools were:

New York City Public Schools: The Bronx High School of Science, the Herrin High School Aviation Annex, Brooklyn High School of Automotive Trades, and the Eastern District High School of Brooklyn

New Rochelle Public Schools: All three high schools

The Farmingdale High School, Long Island

The Sewanhaka High School, Long Island

The Cardinal Hayes High School, New York City

The Hackley School, Tarrytown, New York

The Horace Mann School for Boys, New York City

Where, as in most cases, someone was given a special assignment to direct this work in a school or school system, the superintendent or head of the school also participated extensively.

The Science of Aeronautics.

At the first meetings dealing with subject matter, held early in March, those selected to direct the program in the various schools were presented with a detailed analysis of the contents of the longer and shorter manuals of the Civil Aeronautics Authority, the most inclusive commercial texts in the field, and the Canadian Air Cadet manuals. After the scope of the subject matter had been determined and tentative time allotments made to the various subdivisions, the schools selected the topics on which they were to work and went about the organization of classes. The teachers in the various schools assigned to each topic were formed into a committee which planned the procedure in detail. The central office made available texts, film slides, moving pictures, charts and other available instruction material. Each committee met at least once a week with a coördinating officer from the central office staff as the project proceeded. They worked together nights, Saturdays, Sundays and holidays. In the early meetings when the subject matter was selected the realization that these boys with whom they were working were but a short way removed from the great adventure, made the group impatient with many of the issues that arise when a new subject is under consideration. This was not just a new subject, this was an effort to give these boys whatever would promise to make them better fliers. Nothing was done because it was thought "a nice thing to do," nothing was included that was just something that might be "nice for a flier to know." The test of utility was ever present. There was a feeling that good decisions might save thousands of lives; inadequate decisions might mean that many boys would not come home again.

By this process materials were tried out, new materials were written, boys' problems of learning were noted, ways

of bridging inadequacies in past mathematical or scientific training were bridged. In this setting it was not difficult for these men to come to the conclusion that if the resulting materials took a year and half for mastery, then not less than one and one-half years should be allowed. In this spirit the issues of how much mathematics should be required or whether the emphasis should be physics or aeronautics were quickly resolved. The answer to the one was that there should be no mathematics drawn in for the sake of teaching mathematics, and where procedure could be developed by simpler graphing methods, these procedures should be taught. The answer to the other was that what proved to be three semester's of work could hardly be infused into a traditional one-year physics course.

Finally from each group[1] one or two men were selected for final preparation of the text of new materials and these men were relieved by their schools to carry through this final task. All of the seven texts were edited by Dr. H. Emmett Brown of the Lincoln School and Dr. Ralph Horton, the director of the New York City project and the final texts were submitted to outstanding subject matter experts for subject matter authentication before they were turned over to the Civil Aeronautics Authority on June 30th, less than four months after the first conference was called.

Throughout this work this group of men had in mind that the boys now in the upper grades of the high school would be called upon to man the fighters and bombers and that they would come from the schools with poorest facilities as well as from the schools with the finest equipment.

This realization counselled that the texts must be such that teachers with little to work with and with no specialized training had to be encouraged to undertake the important task of doing all possible for the boys in the comparative leisure of the last two years of high school in the school year just opening. Every effort was made therefore to make the texts simple and clear, to make them rich in illustration, to provide the answers to boys' questions, to provide simple demonstrations that could be created by the boys themselves out of inexpensive or scrap materials. This accounts for the total of some 900 pages[2] to cover the ground dealt with in 300 pages in the Civilian Pilot Training manual. This accounts for the inclusion of

1 These groups were as follows: Airplane Structures: Alexander Joseph, Bronx High School of Science, New York City, Earl Brownell of the Isaac E. Young High School at New Rochelle, New York, E. D. Perkins, Aviation Annex of the Haaron High School, New York City; Human Factors in Flight: Ralph E. Horton, New York City School System, Frederick L. Lobdell, of the New Rochelle School System; Aerodynamics Alexander Joseph, Bronx High School of Science, New York City, Brother Gery of the Cardinal Hayes High School, New York City, Paul Kaye of the Bronx High School of Science, William F. LeSeur, Brooklyn High School of Automotive Trades, C. R. Salit, Sewanhaka High School, Floral Park, New York, Walter Wachter of the Eastern District High School, Brooklyn, New York; Airplane Engines: Ernest D. Perkins, Haaren Aviation Annex High School, New York City, Walter Jankowski, Sewanhaka High School, Floral Park, Long Island, Walter Anderson, Farmingdale Public Schools, Farmingdale, Long Island, H. J. Lockhart, Farmingdale Public Schools, Farmingdale, Long Island; Meteorology Harry H. Williams, Horace Mann School for Boys, New York City, Brother Eymard, Cardinal Hayes High School, New York City, Wallace Purdy, Sewanhaka High School, Floral Park, Long Island; Communications E. E. Eberle of the Sewanhaka High School, Floral Park, New York, William Koster of the Farmingdale High School, Farmingdale, New York, Arthur B. Hussey, New Rochelle High School, New Rochelle, New York, Lester B. Emerson, Albert Leonard High School, New Rochelle, New York, Harry M. Cook, Hackley School, Tarrytown, New York, Victor L. Miller of the Bethpage School, Farmingdale, New York; Air Navigation: S. L. Greitzer, Bronx High School of Science, New York City, George P. Howard, Hackley School, Tarrytown, New York, T. J. Kalligan and D. N. Moore of the Horace Mann School for Boys, New York City, Brother Vincent and Brother Zenon of the Cardinal Hayes High School, New York City.

2 Aviation Education Research Group Project, Teachers College, Columbia University, "Science of Pre-Flight Aeronautics for High Schools," Macmillan, 1942.

demonstrations in the tests themselves, where students can have access to them. It accounts for the 250 page teachers' manual[3] geared closely with the texts.

For the sake of these tens of thousands of boys in city and country who are destined to be "the few to whom so many will owe so much" it is hoped that thousands of teachers armed with a willingness to work these matters out with the boys themselves will dare to undertake this inspired task. They must not, they dare not, approach this problem in the accustomed manner. They must do all they can to build understanding and skills into the nervous systems of these boys so that whatever training they may get in the military service will be that much more assurance of brilliant service on the field of battle and of triumphant return when the battle has been won.

The Program Developed for ATCA.

The attention of the whole project was centered on doing for boys whatever could help them prepare for the trying task that lies ahead so inevitable and so inescapable. Clearly the opportunity to learn the science of aeronautics, and certain skills in navigation and communication is one of the easiest for all schools to provide. But there are other provisions that can be made with comparative ease. Remediable physical defects may be discovered and corrected. All boys may be given more appropriate physical training. Boys who have little chance of qualifying for air crew membership may be apprised of the fact and guided toward other types of service in the air corps or elsewhere. Both boys and girls with a desire to serve in the air branches may be helped to find a place fitting their abilities and interests. Some will find from their contacts with the theory of flight a place in the construction or designing of planes. Some through a better understanding of engines may seek specialization in maintenance of engines. Some through an understanding of meteorology may wish to prepare themselves as meteorologists.

We may therefore consider the opportunity to study aeronautics as having guidance function quite as much as a training function. Both the boys and the services may thus be saved mistakes in placement and the accompanying disappointments and losses of time and effort. This calls only for someone in each school to have the task of studying the students in relation to what is known of their past work and experience and how they respond to the phases of the course in aeronautics. It is something about which, with a little help, any school can perform a worthwhile service for the boys in its charge.

The fact that these boys are going to enter a mysterious new way of life, one in which their relations to their fellows and those in authority will be quite different from what they have known, provides a further challenge to the schools. The average boy going away to college is torn with fears and misgivings. How much more is the unease that accompanies the contemplation of entering so irrevocably a way of life that seems so utterly foreign.

Any school with a little help can do something to still these fears and

3 Aviation Education Research Group, Teachers College, Columbia University, "Teachers' Manual for Science for Pre-Flight Aeronautics for High Schools," George Franklin Stover, Editor, Macmillan, 1942.

to smooth the transition. The American armed services are not so unreasonably different from the life in school as the tales of dramatic incidents tend to make them appear. They have their discipline and their freedom. They have their opportunity to meet all types of men on a level of equality seldom found in civilian life. Boys can be led to see this inevitable experience as having many bright and interesting facets, full of challenge to high-spirited youth. Schools can be helped to provide this orientation to a different way of life.

The fact that the boys entering the aeronautics courses will have a long grind of hard study gauged to a level of mastery not commonly required, counsels friendly, fatherly guidance during a period of waiting and hard work. Bringing these boys together periodically to discuss these points will help. Acquaintance with military customs and their functions will remove some of the mystery. Many believe that the pomp and circumstance of military organization and drill will help to infuse a spirit of seriousness and sustained purpose in the other phases of the program and will itself contribute to an easy transition into military life.

The science of pre-flight aeronautics is designed to help the fliers. It must be taught in many places with a minimum of equipment and by teachers without specialized training. These two facts counsel the provision of a standardized testing service that will help the schools gauge the effectiveness of their work.

All but three of these points were included in the program developed by the twelve schools. While classroom teachers worked with Dr. George Franklin Stover and other members of the central staff on the pre-flight aeronautics phases of the program, the directors of the program[4] in the various schools worked with the central office staff in the development of administration and guidance manuals and in the planning of a program standardization testing for the science of aeronautics.[5]

Guidance.

Throughout the period of the study the directors of the local programs considered the guidance function as of a degree of importance comparable with that of the science of aeronautics. Working under the chairmanship of Sim Joe Smith, assistant superintendent of the New Rochelle Public Schools, with the assistance of Norton L. Beach and James K. Harris of the central staff and of Professor Harry Kitson of Teachers College, this group evolved a record form for assembling information from the school records, outside experience and tests which would help the school in the continuous observation of each student's development and would provide the school a wealth of authentic information which it could supply the military authorities on request. It assembled information on various air crew jobs and the desirable character-

4 The physical conditioning manual and medical examination forms and the teacher and the student manuals on military drill and orientation were developed by men co-opted by the central office staff for these particular purposes.

5 The local directors participating in these phases of the project were Mr. Alfred Baruth, Horace Mann School for Boys, New York City; Mr. John Chisholm, Farmingdale Schools, Farmingdale, L. I.; Dr. Herbert Clish, New Rochelle, N. Y.; Brother Nathaniel, Cardinal Hayes High School, New York City; Mr. Howard Nordahl, Sewanhaka High School, Floral Park, L. I.; Mr. S. J. Smith, New Rochelle Schools, New Rochelle, New York.

istics of personnel associated with each. It made suggestions on testing and counseling. The result was a forty-five page teachers' manual[6] representing weeks of observation of the boys who were in the aeronautics courses. Invaluable assistance and inspiration was given the group by Mr. Clayton Knight, who brought to the task his experience as a flier in World War I, his experience in selecting men for service in this war and an unusual amount of human understanding. Mr. Knight is a member of the Board of Directors of the Air Training Corps of America.

A better idea of the scope of the manual is given by the topics treated:

Chapter I *Administrative Procedures*
- Selection of Counselors
- Function of Counselors
- Time allotment for counseling
- Size of group to be counseled
- Extra-curricular activities
- Library facilities

Chapter II *Purpose and Objectives of the Guidance Program*
- Selection of pre-flight groups
  - Personality rating
- Recommendations concerning health protection
  - Follow-up work
  - Health record
- Orientation — a program of adjustment
  - Qualifications for flying crew
  - Requirements of enlisted personnel
- Individual progress
- Cumulative record form
  - Personal data
- Achievement in Science of Aeronautics
  - Record of intelligence tests
  - Extra-curricular and out-of-school activities
  - Anecdotal record
    - Illustrations of anecdotal recordings
    - Rating of character traits

Chapter III *Case Studies*
- Inventory of Counselees
- Brief analysis of record and problem to be considered (six cases)

Administration.

This same group, working under the chairmanship of Dr. Ralph Horton, director of the program in the three New York City public high schools, with the assistance of Mr. James K. Harris and Mr. Martin L. Beach of the central staff and with the counsel of Professor Elbert K. Fretwell of Teachers College, prepared the manual dealing with the problems of organization and administration. The outline of this twenty-seven page manual[7] follows:

Chapter I *Organization of Local ATCA Units*
- General Purpose
- Awakening interest in the Pre-flight Aeronautics Program
- School Organization
  - Plans for organization
  - Selection of staff
  - Implications of membership
  - Parents' consent
  - Names of units
  - Uniforms and insignia
  - Committee of community sponsors
- Club Organization

Chapter II *General Pattern of Central Office Services*
- Manual of Guidance for Young Airmen
  - Physical training for airmen
  - Object of military training program
  - Cumulative record card
  - Standardized tests

Appendix
- Organization charts with and without military drill

6 "A Manual of Guidance for Young Airmen," Air Training Corps of America Incorporated, 285 Madison Avenue, New York City, June, 1942.

7 "Manual of Administration A Manual for Assisting in the Organization, Administration, and Operation of Units of the Air Training Corps of America," Air Training Corps of America Incorporated, 285 Madison Avenue, New York City, June, 1942.

The Testing Program.

Physical test forms are included in the physical training manual. The science of aeronautics testing requires, according to the judgment of the group, systematic objective tests, a new form of which should be available at the end of each semester and at the end of each summer — three forms a year. Plans for such tests were developed by the committee of local directors with the help of army air corps advisors. The aid of the Coöperative Testing Service was enlisted in perfecting plans for a testing service. The results are described in the Administration Manual.

Physical Training and Military Drill and Orientation.

The problems of developing physical training and military drill and orientation manuals were attacked somewhat differently from those of developing the course in pre-flight aeronautics.

To develop the physical conditioning manual the services of Dr. Elmon L. Vernier, director of physical education of the New Rochelle Schools, were obtained. He developed the manual[8] with the assistance and advice of air corps authorities and of city and state directors of physical education.

Early in the project a military drill and orientation manual was developed with the assistance of Lieutenant Colonel S. J. Donovan of the Army Air Corps. It was made available to the schools interested in offering such work. The experience of these schools was gleaned by Brother Norbert of the Cardinal Hayes High School, a West Pointer himself, and two manuals were developed by him with the assistance of representatives of the Army and Navy Air Corps.[9]

A Unitary Task.

The reader is cautioned that the preceding section is not presented as the ATCA program, but rather as the work developed out of the twelve school projects for the ATCA organization. It should be understood that this group of schools was concerned with the development of a program that could readily be operated by *any high school in America.* Clearly there are other activities that some schools can and should undertake to do all possible for their boys; gliding, specialized courses, gunnery, etc.

What is presented in this report is a unitary task. The fact that part of it was eventually carried to completion by the Civil Aeronautics Administration research project while the other parts have gone to make up part of the ATCA program should not be allowed to confuse this point. We, the last of the earth-bound, bear the responsibility and the privilege of doing whatever we can, all of this and more as we see the light, for these of the first generation with wings who are fated with a task of such immense importance and danger.

What has been done has been done in a crusading spirit — the men from these schools, Robert Hinckey and his staff of the Civil Aeronautic Author-

8 Elmon L. Vernier, "Physical Training for Airmen: A Manual for the High School Physical Education Teacher," Air Training Corps of America Incorporated, 285 Madison Avenue, New York City, May, 1942.

9 "Instructors Guide Book for Drill and Formation," Air Training Corps of America Incorporated, 285 Madison Avenue, New York City, June, 1942. "Airman's Manual for Drill Formation," Air Training Corps of America Incorporated, 285 Madison Avenue, New York City, June, 1942.

ity and the pioneering spirits in the ATCA organization are a group to which this fall will add tens of thousands of teachers in the schools of America, public, private and parochial and many leaders of boys' groups where the schools themselves fail to rise to the challenge.

Having said this, it should also be said that although those of us who worked on this project found the needs of these boys in war stimulating enough, the science of aeronautics phase of the program has a broader setting than war. These students are not only to be called on to fight the battles of this war; they will be prepared to be the pioneers in a new age of air when this war finally has been won.

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EDITORIAL

Heroism *for the* Curriculum

By CARL G. MILLER

A month ago the President took time out to make a speech and commend some naval heroes.* It is one of his jobs to see that heroes receive due honor, and the fact reminds us that another era of heroism is at hand. The point is one for the cohorts of education to note, for in the last decade or so teachers have been so busy over Johnny's and Susie's self-expression and self-development that the idea of giving up some of one's self for a great cause has been a bit neglected. In fact, some teachers have had considerable doubtful fun helping some writers deflate some of our national heroes.

With all of us in need of direct suggestion to promote the war effort, there is this "subject" of heroism which could be added to the "curriculum." It will be an extremely practical one for most of the boys in college, and if the war continues as long as some Gloomy Guses say it will, it will be practical for many high school youth. For others an understanding and appreciation of heroism will be an excellent addition to their background of culture.

There are many youth who deep in their hearts would rather be a live slave than a dead hero, but for most boys and girls there is a good chance to motivate this "subject." Most of them, we know, can be induced to make many ordinary accomplishments for the social approval that follows, this principle being one of the great secrets of successful teaching. But what is heroism if it is not social approval of the highest order? As boys go off to war, they dream of returning as heroes — heroes to the public or at least a hero to one member of the opposite sex. Why not capitalize on the fact? Making the principle work will win the war faster.

One thing to be sure of, however, is that teachers themselves have clear ideas of what heroism is. First of all, there must be devotion to a great cause. In this respect allied soldiers certainly have the advantage of their enemies. The Japs and Germans may have a great devotion to an emperor or a fuehrer, but certainly the cause is not one to merit high rank. It is doubtful if the spiritual natures of Japs and Germans (if they have any) rate their cause very high. Second, heroism calls for the highest type of courage. Third, it calls for self-denial or even self-effacement. Heroism is a form of self-expression, it is true, but it is not one for the perpetuation of self. Teachers, incidentally, can help in the miscalling of heroes, an act that is rather prevalent for inexperienced newspaper reporters. There are many men involved in the war effort for selfish purposes, not selfless, and it will be helpful if teachers can help separate this chaff from the wheat when it comes to giving labels.

Finally, there are the examples. Our growing young Americans need to get better acquainted with such heroes of the past as: Nathan Hale, who, with a rope around his neck, regretted that he had but one life to give for his country; John Paul Jones, who, with his old "tub" the *Bon Homme Richard* badly battered and in a sinking condition, declared he had just begun to fight; Admiral Nelson, who before he died at the moment of victory at Trafalgar, hung out the famous signal which said England expected every man to do his duty; Admiral Farragut, who after hearing a report that enemy torpedoes were immediately ahead, damned the torpedoes and ordered full speed ahead; Colín Kelly, who after using his plane as a human torpedo to wreck a Jap battleship, had in death nothing to say, but whose action spoke loudly over international networks. Reading stories of such men as these have what seems to the author a God-ordered effect on all of us.

* Dedication of navy medical center at Bethesda, Md., on August 31.

BOOK REVIEWS

"Porter Sargent knows more about private schools than anyone else in the world. His *Handbook of Private Schools*, now in its 28th edition has long been as unrivaled in its field as Burke's *Peerage* and *Who's Who in America* in theirs, and his extended introduction as to the Handbook is always about the most exciting item in the educational literature of the year. His constituency includes the snob schools and their patrons, but he has never sold out to any private or class interest in education. His criticisms of the educational system are uninhibited, provocative and enlightening. He views with a cold and cynical eye the rush of the colleges into the war and the enthusiasm with which historians become propagandists. Sargent is, one gathers, heartily in favor of supporting the national cause, but he thinks that educators and properly educated people ought to perform a higher service than the promotion of credulity, hatred and the uncritical acceptance of nationalistic myths." — Paul Hutchinson, *Christian Century*, July 8, 1942 .

Education in Wartime is the title of the 224-page separately published Introduction to this 1136-page Handbook, published in May. This reports on recent thought, activities and writings from books, periodicals and addresses of educators and public men,—with interpretations of current tendencies indicative of deeper and more permanent trends.

Already it is acclaimed — "The most constructive thing that I have seen and ought to provoke a lot of constructive thinking in the educational world," Pres. J. G. Van Meter, Lees Junior College. "Will be increasingly amusing as the years pass," H. L. Mencken, Md. "Illuminating and thorough," Edward C. Mack, Columbia University. "A splendid piece of work, Alfred Korzybski, Chicago. "An excellent study well worth the money," C. W. Patton, Oklahoma Baptist University.

In April Porter Sargent put forth a 232-page *Guide to Schools, Colleges and Camps* (7th ed.). Marked to sell for 50c, free copies were sent to thousands of principals of junior high and grammar schools, Chambers of Commerce, etc., offering a large discount for quantities.

Teacher Training for Industry. By *C. C. Aiken* and *Scott B. Lilly.* McGraw-Hill Book Company, New York. 1942. XVII and 144 pages. $1.25.

One of the big jobs facing American educators today is the training of teachers for war industries courses. Those whose experience has been in the field of vocational-industrial teacher-training are in the best position to carry on this work and these educators must scrutinize thoroughly their methods and technics and speed up the job in hand so that the victory may be won completely and in the shortest possible time. Throughout the country there are hundreds of training programs for the war industries now in operation. Older men, younger men, and women of all ages are being trained for the war industries. The problem of securing teachers for these training programs is an acute one and already a serious shortage of adequately prepared teachers exists. Should this shortage continue, the progress of our whole ambitious industrial program may be jeopardized. The present helpful little volume was developed through the coöperative efforts of over a score of industrial training and personnel executives, educational psychologists, and teachers of engineering. A definite teacher-training program was evolved and this volume constitutes a course of some ten sessions devised to train both prospective vocational teachers and teachers for the ESMDT classes. Although the compilers do not point to their course as the final word in industrial-teacher training, they have allowed the publication of their notes in the hope that their efforts may aid the total war effort. The volume is going to be a handy one for every director of a war industries program to have on hand.—WILLIAM P. SEARS, Jr., Associate Professor of Education, Principal, N. Y. U. Training Program for War Industries.

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